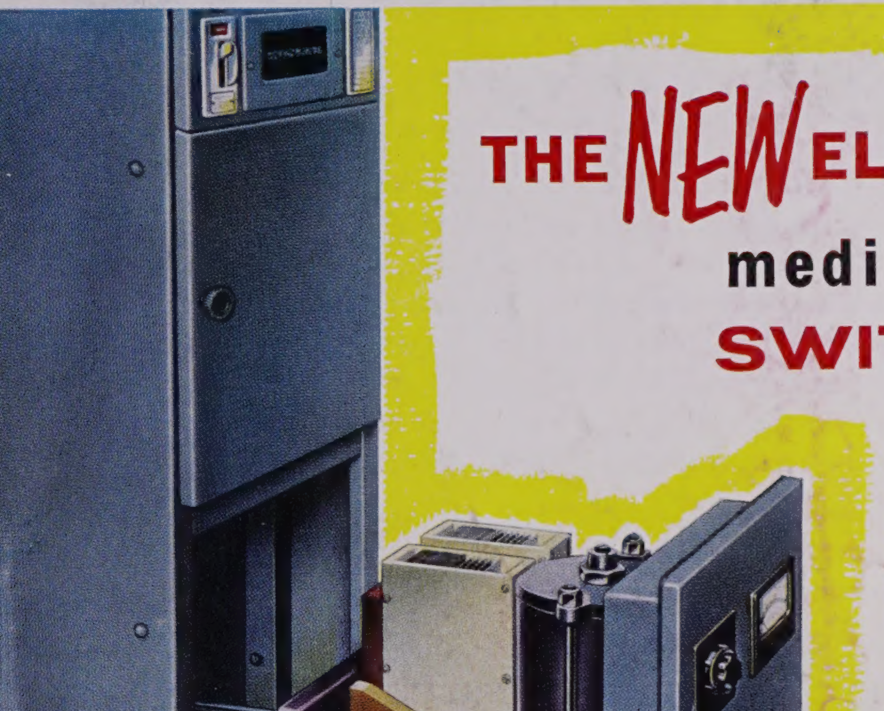
ELECTRICAL REVIEW 24 MARCH 1961

ELECTRICAL ENGINEERS EXHIBITION SURVEY

ELECTRICAL REVIEW

FRIDAY
24 MARCH 1961

WEEKLY
PRICE 1s 6d



THE NEW ELLISON AIR-BREAK medium voltage SWITCHGEAR

- *Unusually compact dimensions (800 amp. - 18¼" wide).*
- *Certified to ASTA No.16 at 31 MVA (Class A) and 26 MVA (Class B).*
- *Triple-action contact movement.*
- *Double-tier mounting.*
- *Interchangeable circuit breakers and isolators.*
- *Manual, spring-assisted or solenoid operation.*
- *Safe and simple isolation—special interlocking features.*
- *Two-stage isolation facilitates testing.*

TRADE MARK

MAY WE SEND FURTHER INFORMATION?

GEORGE ELLISON LIMITED
PERRY BARR · BIRMINGHAM 22B

882

1901

We've seen some things in our time. The introduction of Micanite to Europe. Bushings for the National Grid. Working voltages rising to 380 kV and over. New resins; silicone, epoxide, melamine, PTFE, etc. New materials; copper faced laminates, glass fabric laminates, mica paper, etc. New applications in nuclear power stations, electrically propelled passenger liners, diesel-electric locomotives, automation, jet airliners, rockets—*all challenging the abilities of the electrical insulation engineer.*

Whatever the requirement, we have always done our best to meet the needs of the electrical industry with the finest insulation—we are going to go on doing just that in our next 60 years.

m and i

the electrical insulation people

THE MICANITE & INSULATORS CO., LTD.,

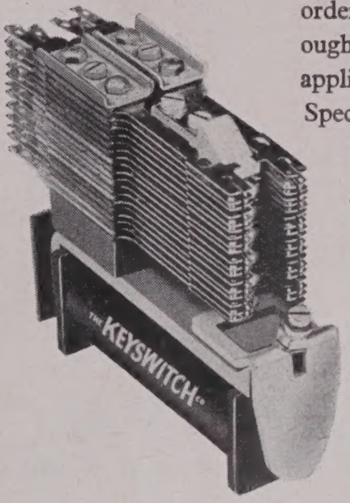
Empire Works, Blackhorse Lane, Walthamstow, London, E.17

Telephone: Larkswood 5500. Telegrams: Mytilite, London, Telex. Telex: 25183.

1961

YOU CAN TELL A MAN WITH THE RIGHT CONTACTS

. . . but you can't tell him much. He knows about Keyswitch Relays and orders direct from the makers — avoiding many hitches and delays. You ought to know that Keyswitch Relays are everywhere in multifarious applications, from the simple electronic to complex supersonic fabrications. Specially built or ex-stock.



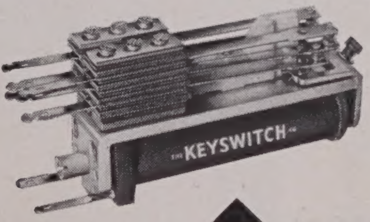
MAJOR TYPE 'BPO 3000'

The best known and most useful relay available. Spring sets allow from one make or break to 12 changeovers. For minute or heavy switching. Sensitivity down to 20 milliwatts. Adjustable for critical timing, fast or slow operation. Standard or Tropical finish. Special adaptations can be supplied. Transparent covers are available.

and now PLUG-IN 3000 Type Relays.

Plug-in facilities in addition to all the versatility and well-established, reliable features of the world's best known relays.

- ★ **Positive contact between male and female pins.**
- ★ **Contacts: up to 18 light duty or 12 heavy duty.**
- ★ **Complete transistorised units.**
- ★ **AC or DC operation.**
- ★ **Transparent or metal cover.**
- ★ **Clip retains relay positively in any position.**



MINOR TYPE '600'

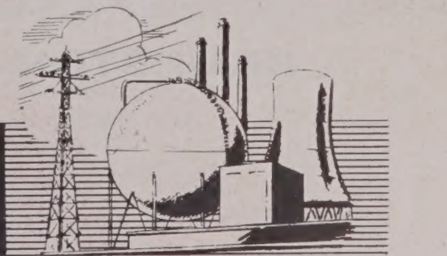
(Fitted with double pole changeover for 250 volts 2 amps.)

Ideal for simple switching operations where lightness, compactness, and economy are prime considerations. When fitted with contacts similar to those of the 'B.P.O.3000' type it is faster in operation and release.

PLUG-IN TRANSISTORIZED UNIT

Operation AC or DC. Switching or Signal Current AC or DC. 5 to 500 micro-amps. Transfer switching current up to 10 amps. or 500v.

SOCKETS AND FITTINGS ARE AVAILABLE FROM STOCK for immediate assembly of units.



KEYSWITCH RELAYS

FOR ALL PURPOSES

A unique Calculator providing full Relay Specifications is available FREE on request.

Extremely advantageous quotations can be offered for quantity orders.

manufactured as required for customers' own applications in:—

AUTOMATION - COMPUTERS
BATCH COUNTING and PHOTO-ELECTRICS
AUTO-TIMING and AUTOMATIC SIGNALS
TELEPHONE and INTERCOM SYSTEMS
MOTOR and MACHINERY CONTROL
CURRENT and VOLTAGE REGULATION, Etc.

Contact Sales Director

THE KEYSWITCH CO., IRONGATE WHARF ROAD, PRAED STREET, LONDON, W.2
Telephone: PADdington 2231

CONTRACTORS TO HOME AND OVERSEAS GOVERNMENTS AND H.M. CROWN AGENTS

1901

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m and i

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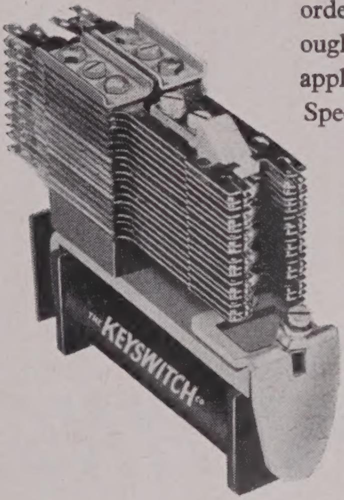

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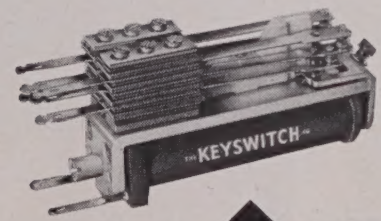

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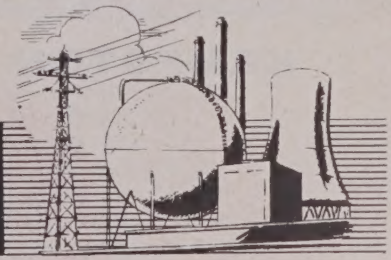

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AUTOMATION - COMPUTERS
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Telephone: PADdington 2231

CONTRACTORS TO HOME AND OVERSEAS GOVERNMENTS AND H.M. CROWN AGENTS

NEW!

A RANGE OF

COMPACT SLIMLINE FITTINGS

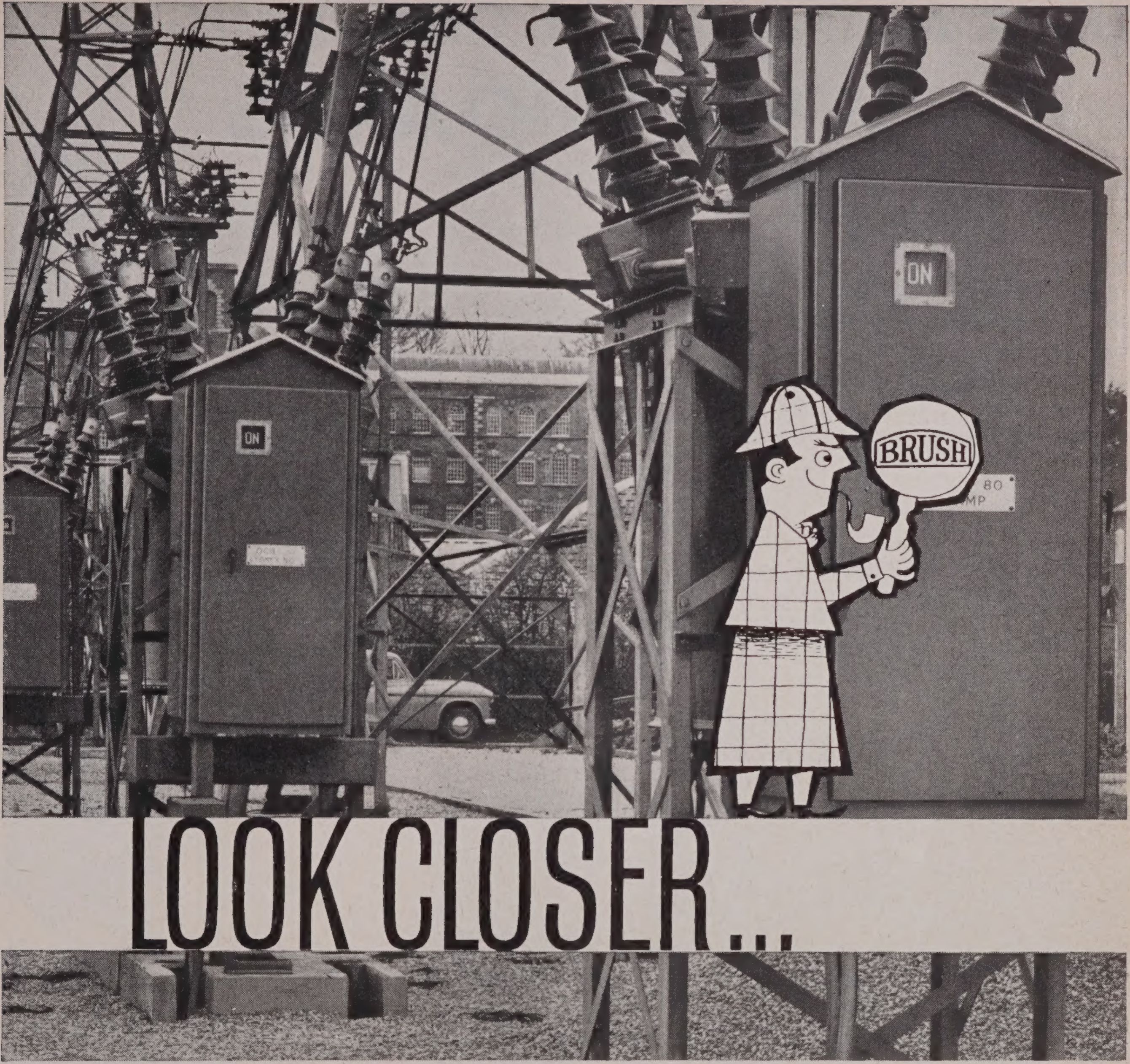
DETAILS AND PRICES FROM

CRYSELCO LIMITED

LAMPS AND FITTINGS

KEMPSTON WORKS · BEDFORD

BRANCHES— BIRMINGHAM BRISTOL BURY ST EDMUNDS CARDIFF GLASGOW LEEDS
LEICESTER LIVERPOOL LONDON MANCHESTER NEWCASTLE NOTTINGHAM SOUTHAMPTON



*. . . and you'll find the name on this Outdoor Circuit Breaker.
That name is Brush and to those who are concerned with electrical
installations it is synonymous with absolute dependability.
Brush 33 kV Oil Circuit Breaker Units comply with
requirements of British Electricity Boards' Specification BEBS-S4.
33 kV Breakers are short-circuit tested for
800 & 1200 ampere 500 MVA Rating, 750 MVA Rating, 1000 MVA Rating.
Also Short-Circuit tested to the American Standard for
Re-closing Service on Power Circuit-Breakers, (Specification
C. 37.7. Re-closing Duty Cycle 111) for a rating of 500 MVA at 34.5. kV.
Brush will design, supply, erect and commission a complete
33 kV sub-station from a simple line drawing enquiry.*

A.S.E.E. Exhibition
Earls Court: March 21st–25th

BRUSH

Visit us on Stand
No. C6

BRUSH ELECTRICAL ENGINEERING CO. LTD · LOUGHBOROUGH · ENGLAND

A member of the Hawker Siddeley Group

UNIT AND CUBICLE CONSTRUCTION
SWITCHBOARDS

Illustration on right shows an indoor totally enclosed unit construction type "Y" switchboard with incoming duplicate busbars feeding common outgoing circuits by means of interlocked fused switches of both 300 amp and 500 amp capacity.

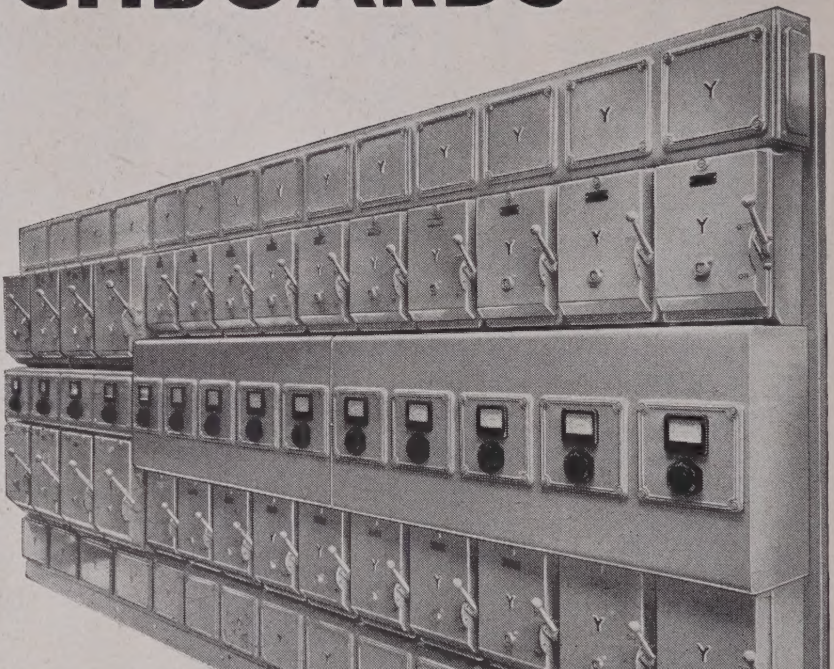
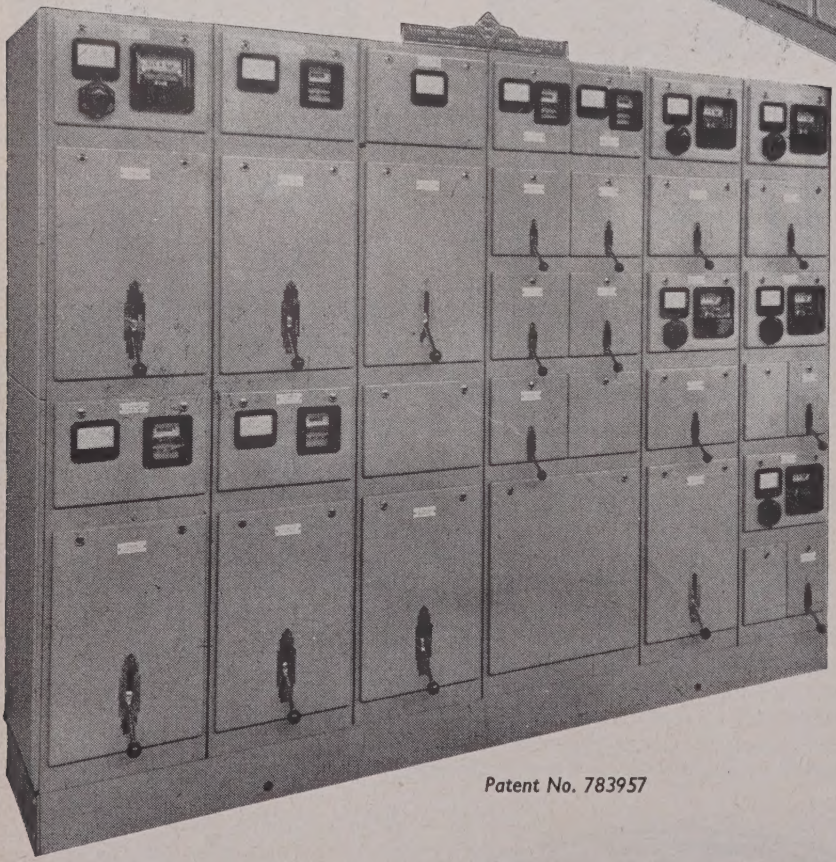


Illustration below shows an indoor all-isolating cubicle construction switchboard having individual metering on the outgoing fused switches of 60 amp, 160 amp and 300 amp capacity.



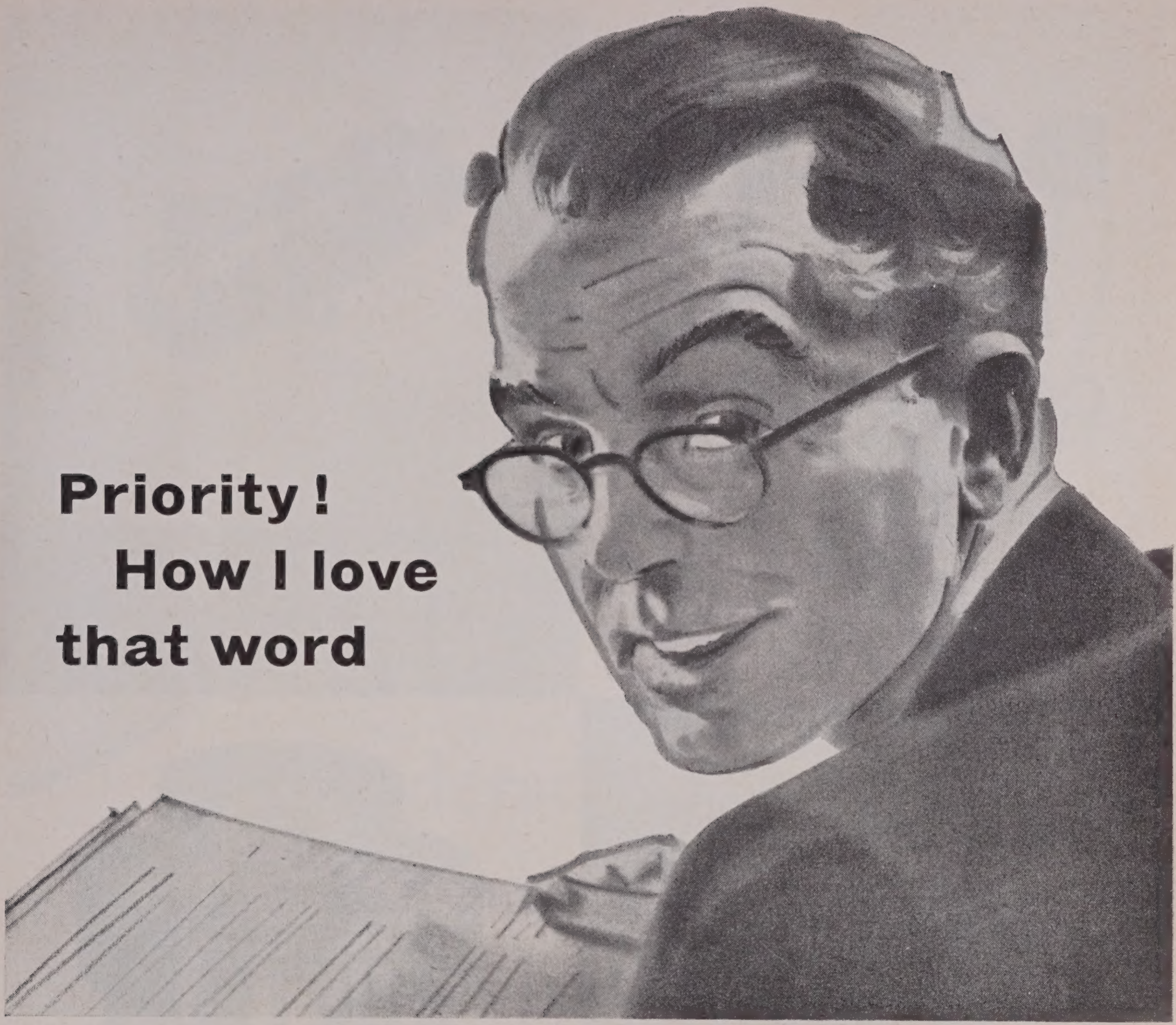
Patent No. 783957

We specialise in building switchboards to your exact requirements with facilities for extension. Designed to give unfailing service under the most onerous climatic conditions whether installed indoors or out of doors.

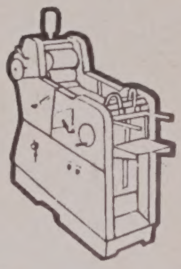
STAND No. 19, Row G,
A.S.E.E. Exhibition,
March 21-25, 1961

ELECTRO MECHANICAL MFG. CO. LTD.

Head Office and Works : Marlborough Street, SCARBOROUGH
Telephone : Scarborough 2715-6
London Office and Showroom : 133-135 Grand Buildings, Trafalgar Square, LONDON, W.C.2
Telephone : Whitehall 3530
Subsidiary of Yorkshire Switchgear and Eng. Co. Ltd., Leeds



Two-thirds of all our print jobs were once marked 'priority'. That meant excuses, excuses all the way. But the Gestelith is so quick off the mark, they don't need to say urgent nowadays . . . all jobs get priority treatment. Life is easier and so is my staffing problem. With the Gestelith, new operators quickly become 'old hands'.



A note for the technically minded

'Quick off the mark' means many things. Just two points: Colour change in two minutes without wash up . . . Only the Gestelith's removable ink unit makes this possible. Really rapid (and we mean rapid) adjustments for head and side lays, squaring the image and setting the machine cycle.

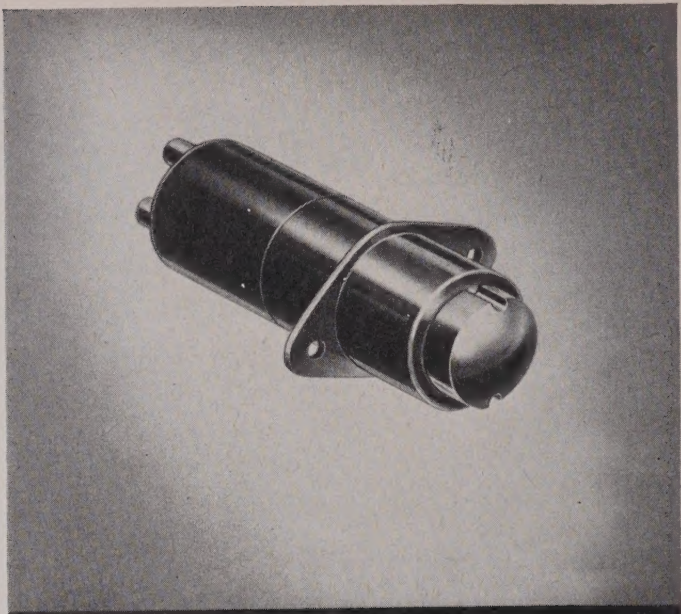
Ask about the Gestelith automatic controls.

GESTELITH OFFSET
DUPLICATORS

GESTELITH DISTRIBUTORS LIMITED
210 Euston Road, London, N.W.1 EUSton 3238
Gestelith is a division of the Gestetner World Organization.

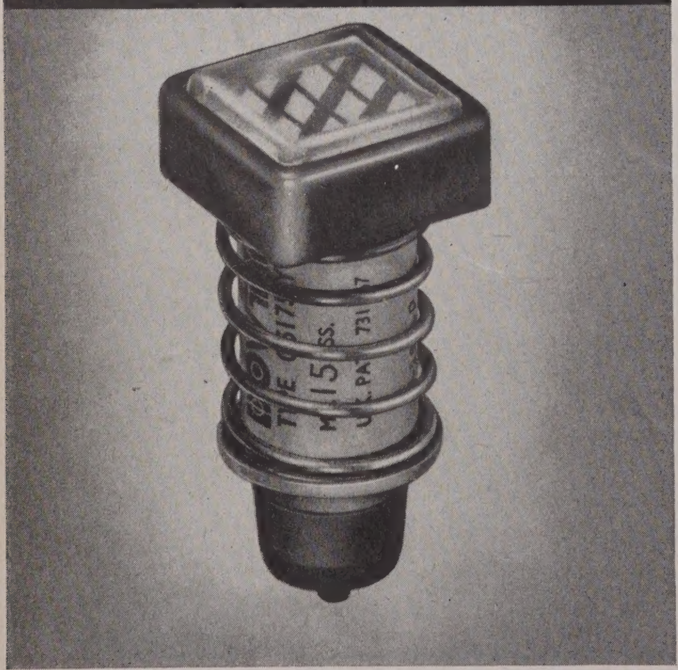
DOWTY

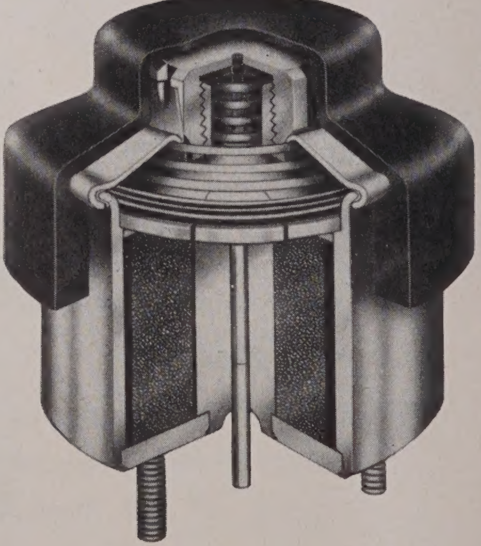
ELECTRICAL
COMPONENTS



BUTTON SWITCH
A fully weatherproofed miniature spring return button switch with a maximum contact rating of 5 amps. Double-pole action with a variety of make and break contact arrangements.

3-POSITION MAGNETIC INDICATOR
Maximum versatility of display, inherently reliable. Provides visual position indication for remotely controlled components.



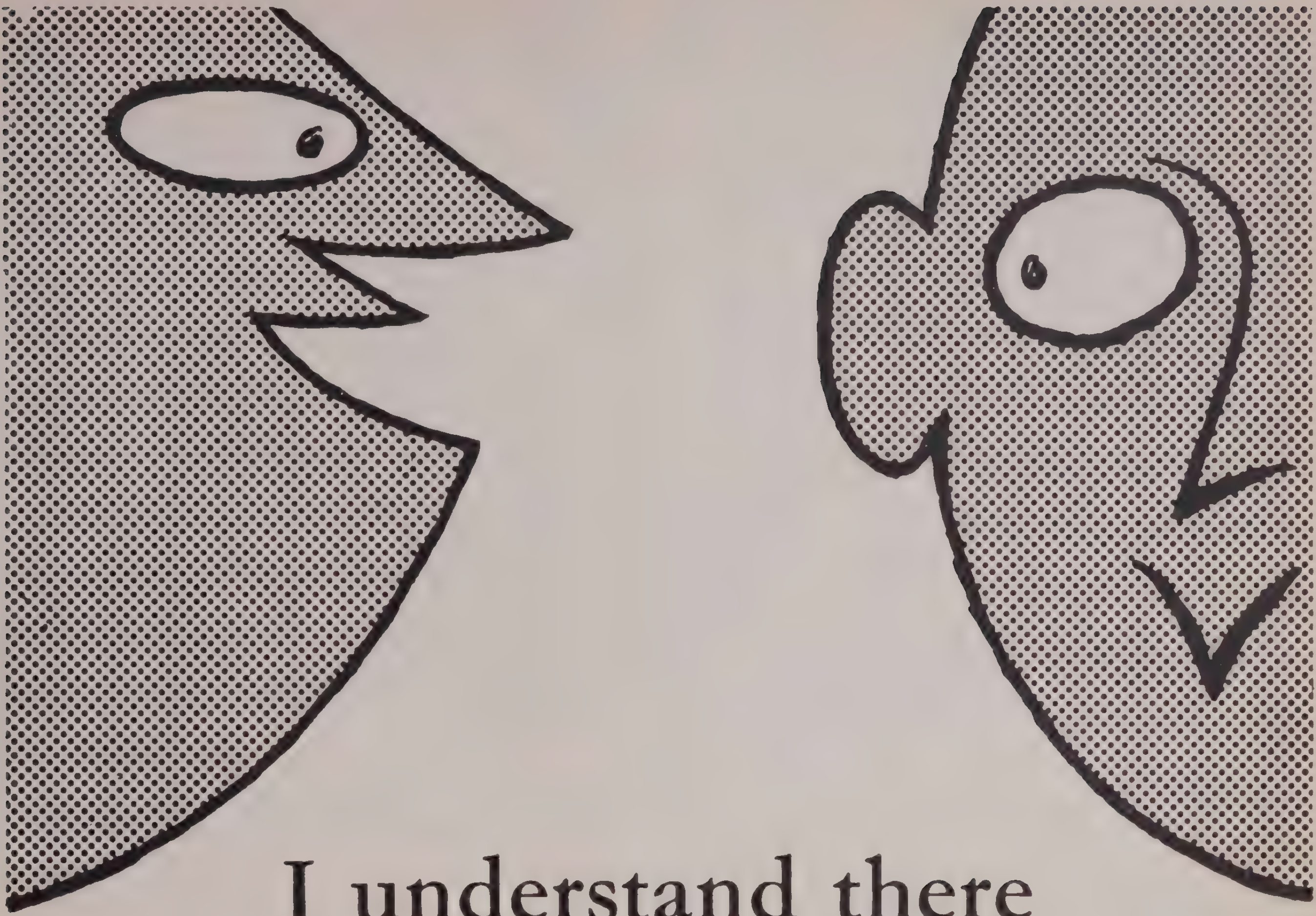


D.C. SOLENOID
A special articulated yoke construction gives exceptionally high performance with low weight and robustness.

DOWTY ELECTRICS LIMITED · TEWKESBURY · GLOS.

Member of the Dowty Group

Telephone : Tewkesbury 2383



I understand there are some very interesting exhibits on the

OTTERMILL

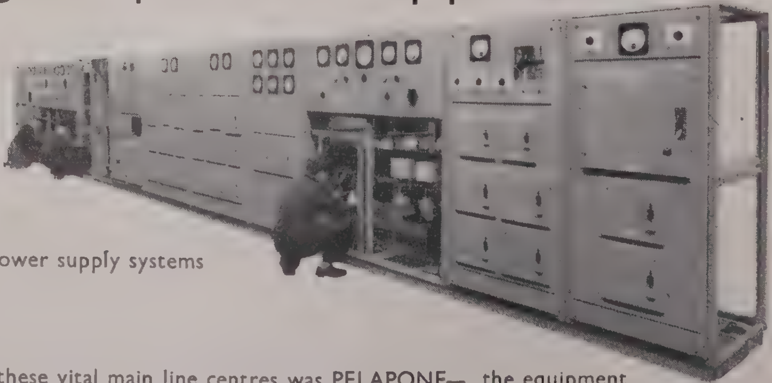
STAND No. G14

You ought not to miss them

British Railways select

*PELAPONE CONTROL and rotating plant

for new signal power supplies



Determined to enhance their proud tradition of safety, reliability and continuous service, British Railways are pressing ahead with their intensive modernisation programme.

This includes the installation of completely new signal power supply systems at Manchester and Crewe.

The choice of control equipment and rotating plant for these vital main line centres was PELAPONE— the equipment with the dependable high performance British Railways—and British Industry—demands.

PELAPONE

PELAPONE LIMITED
SALES DIVISION: 38/40 Bruton Street, London, W.1.
WORKS: P.O. BOX 4, DERBY.

Controlled Power—Continuous Power

660

. . The Vesta and Di-Vesta series of Industrial reflectors fully conform to BSS 232 and allow easy access to lampholders. Vitreous enamel finish, giving complete protection against corrosion. The Di-Vesta series has a detachable reflector for easy cleaning. Range for 100—500w. lamps. Have you got our leaflet?

REVO ELECTRIC

VO ELECTRIC CO. LTD., TIPTON, STAFFORDSHIRE

A Duport Company famous for cookers, fires, fluorescent and industrial light fittings, power tools, street lighting, switch and fusegear etc.

W & W 63

The construction of electrical and electronic equipment is greatly simplified if it is designed from the project stage to make full use of Araldite epoxy resins. This 100 kV pulse transformer by the U.K. Atomic Energy Commission is completely encapsulated in a single Araldite casting, which also forms the insulators. The Araldite binds inseparably with the units, forming a hermetic seal, and also provides permanent attachment for the terminals. Physical dimensions may be considerably reduced by the correct use of Araldite, and castings can be within 0.2% of specified measurements. In short, Araldite can provide a more efficient component, compact in size and lower in cost.

May we send you further particulars of its many uses?

Araldite

EPOXY RESINS

Araldite is a registered trade name

MAY WE WELCOME YOU ON STAND No. J.24 AT EARLS COURT

CIBA (A.R.L.) LIMITED · DUXFORD · CAMBRIDGE · TELEPHONE: SAWSTON 2121

AP/586

Are electrical design engineers ever impressed? Do they whistle with admiration at such things as servo-components?

If they do, many we suspect, will be whistling soon at this range of Siemens-Halske miniature, high efficiency D.C. motors. Available in three sizes, the largest of which measures only two inches long by one inch in diameter, these motors have working voltages which go up to 4v D.C., but they will turn on a signal as low as 50 m.V. Available torques are up to 270 cm. grms at 170 r.p.m., or down to 18 cm. grms at 2,500 r.p.m., with an electro to mechanical efficiency of as high as 70%. The working temperature range is −35 degrees to +65 degrees C.

If you would like further information on these or our A.C. servo range, please write to:—

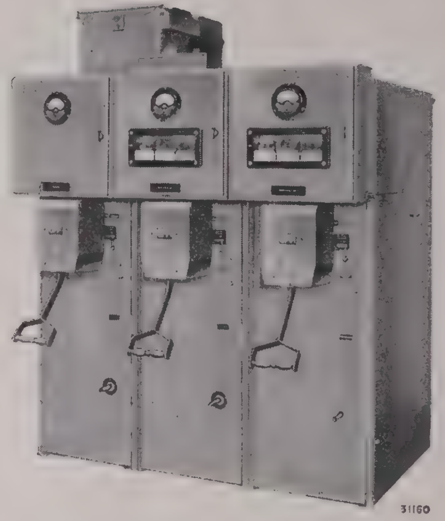
B & R RELAYS LIMITED

B & R RELAYS LIMITED · TEMPLE FIELDS · HARLOW · ESSEX

Telephone: Harlow 25231/4

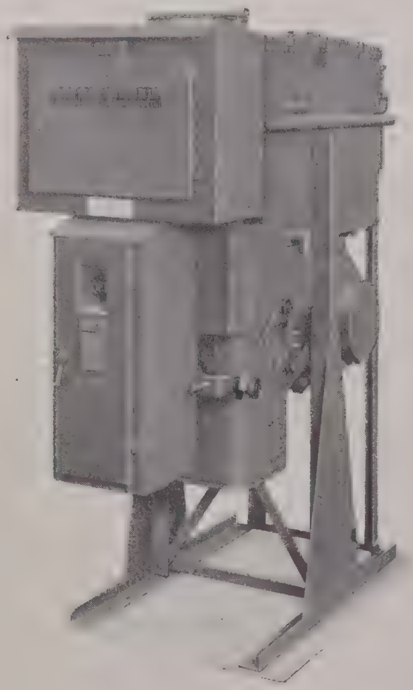
Member of the Gas Purification Group

CIRCUIT BREAKERS



INDOOR UNITS

ALD range of indoor vertical isolation air-insulated Circuit Breaker Units. Current rating up to 1,200 amps. Rated breaking capacities up to 350 MVA at 11 kV, 250 MVA at 6.6 kV and 150 MVA at 3.3 kV. Fitted with Hand, Spring or solenoid power-closing mechanism.



OUTDOOR UNITS

WPD range of outdoor oil and compound filled Circuit Breaker Units. Current ratings 400/800 amps. Tested fault ratings : 350 MVA at 11 kV and 250 MVA at 6.6 kV. Spring, Hand or solenoid mechanisms.

STAND No. T7
ELECTRICAL ENGINEERS EXHIBITION

LONG & CRAWFORD LTD.

GORTON ROAD, MANCHESTER 12

TASKMASTER REGD. LIGHTING TRUNKING

—the answer in the long run

Gear tray supported in temporary position.

Benjamin Lighting Trunking reduces installation cost and maintenance to a minimum. The system gives real flexibility with simplicity of design. The stringent specifications include these features:

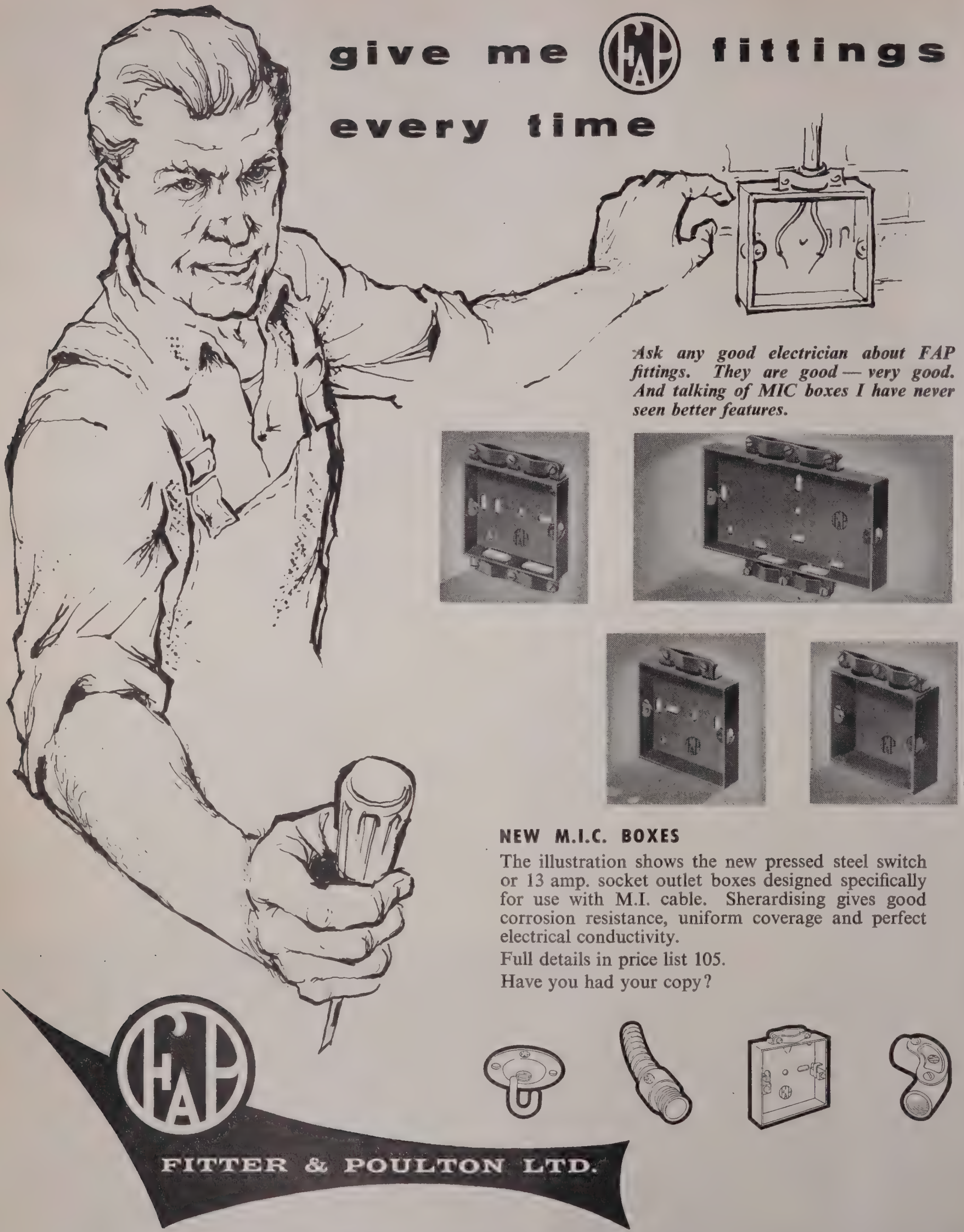
- Light in weight but immensely strong. 9 ft. or 15 ft. centres for suspension with maximum loading.
- One-piece rolled section.
- Easy installation. Joints and suspensions carry the load whilst securing bolts are tightened.
- Lighting units can be moved easily to any position.
- Simple fixing of all fittings and lamps. Easy access to cables, switches, plugs.
- Designed for 8 ft., 5 ft. and 4 ft. standard 'Taskmaster' reflectors and tungsten range.

BRITISH LIGHTING COUNCIL BLC MEMBER

better lighting by BENJAMIN REGD.

ONE OF THE WORLD'S LARGEST PRODUCERS OF INDUSTRIAL AND COMMERCIAL LIGHTING FITTINGS

The Benjamin Electric Limited · Tottenham · London · N.17 · telephone: TOTenham 5252 · telegrams: Benjalect Southtot London



give me FAP fittings every time

Ask any good electrician about FAP fittings. They are good — very good. And talking of MIC boxes I have never seen better features.

NEW M.I.C. BOXES

The illustration shows the new pressed steel switch or 13 amp. socket outlet boxes designed specifically for use with M.I. cable. Sherardising gives good corrosion resistance, uniform coverage and perfect electrical conductivity.

Full details in price list 105.

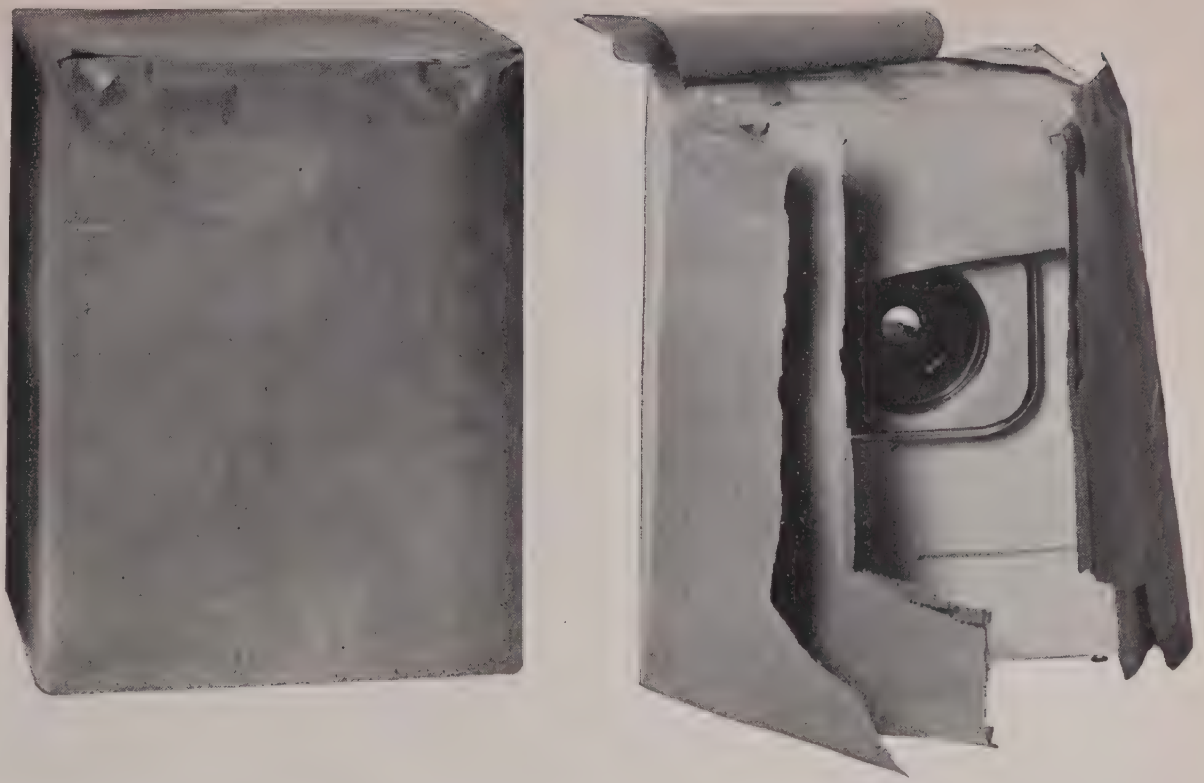
Have you had your copy?

FITTER & POULTON LTD.

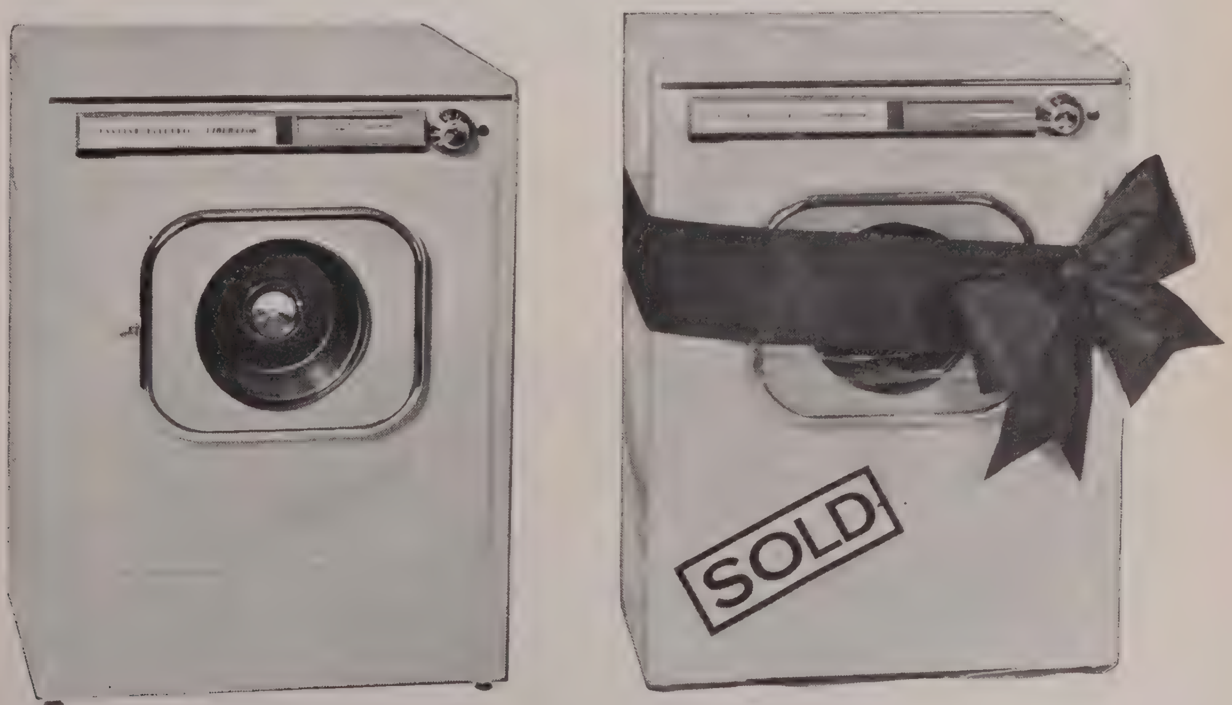
CONDUIT FITTINGS & ACCESSORIES—FLEXIBLE METALLIC TUBING & ADAPTORS

TELEPHONE: CALTHORPE 1151-2
TELEGRAMS: F. A. P. BIRMINGHAM

VINCENT PARADE · BIRMINGHAM 12



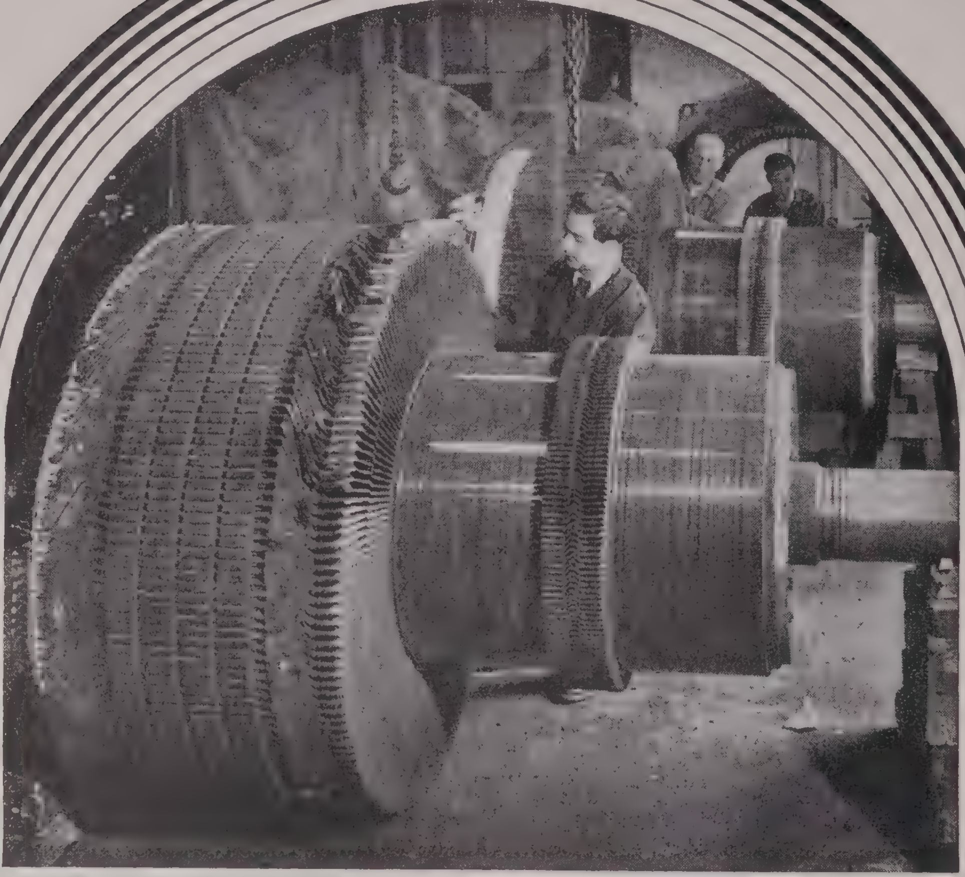
As soon as you've got it unwrapped . . . you have to wrap it up again!



'ENGLISH ELECTRIC' LIBERATOR

the washing machine that sells itself

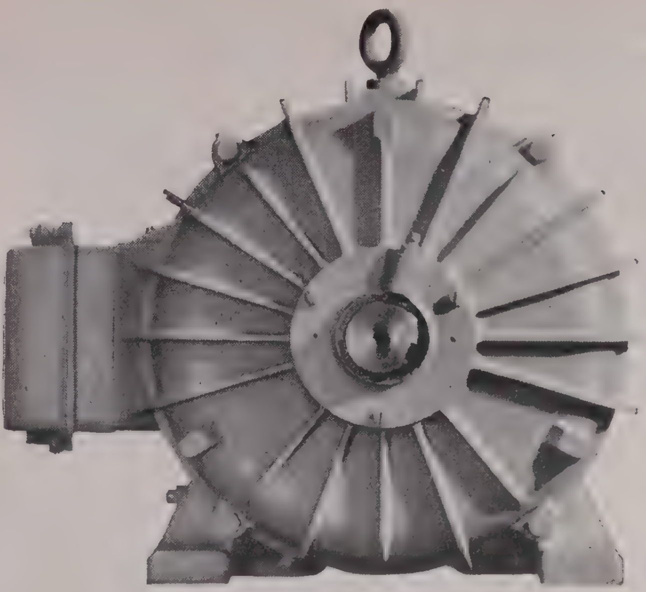
THE ENGLISH ELECTRIC COMPANY LIMITED, DOMESTIC APPLIANCE DIVISION, LONDON AND LIVERPOOL



Engineers' Language! For every Plant Engineer who swears at Collins, there are ninety-eight and a quarter who swear by them. Engineers being engineers, this is quite something. As we were saying, we show two 1500kW 240-volt 600 r.p.m. D.C. Generators, one being stripped out for rewinding, t'other being rewound.

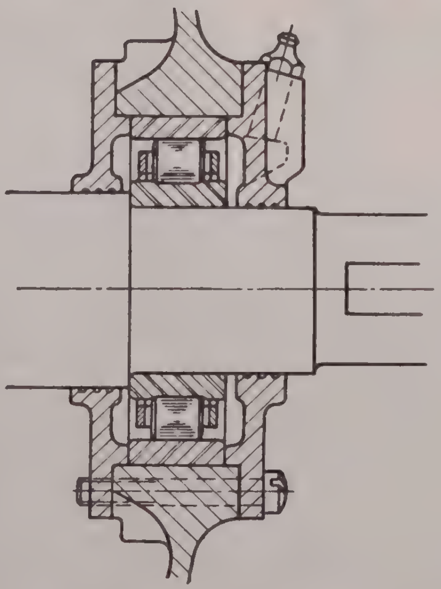
COLLINS

Collins Electrical Ltd.
Head Office 115 Clerkenwell Road London E C 1
Central London Works
22 St. Albans Place Upper Street Islington N 1
West London Works
9 & 11 Featherstone Road Southall
Phone Holborn 0212-4 Canonbury 3227-8
or Southall 0168



Engineers use the word performance in two senses, a limited one which refers to parameters that can be specified and checked; and a wider, vaguer, but essentially more realistic sense which covers freedom from trouble, ease of servicing, adaptability and many other things. Performance in the first sense is reproducible by any competent manufacturer; it depends on designing to well established principles. Performance in the second sense is the basis of choice between manufacturers. It comes from countless small differences in design that are based on know-how or experience.

This thing called know-how



Take for example bearings. We were amongst the first manufacturers to fit ball and roller bearings to electric motors and, in fact, they were standard equipment on our machines whilst the majority of motors still had sleeve bearings. The ubiquity of ball and roller bearings on motors today indicates how right this early choice was. There is a small but important detail in which the housings of the bearings on our motors differ from those on many others. We bore the end-shield clean through and fit two caps. The through bore allows of more accurate gauging—particularly with regard to parallelism—than a blind hole and the cost of the extra cap is in our opinion more than justified by this and by the better grease retention it makes possible.

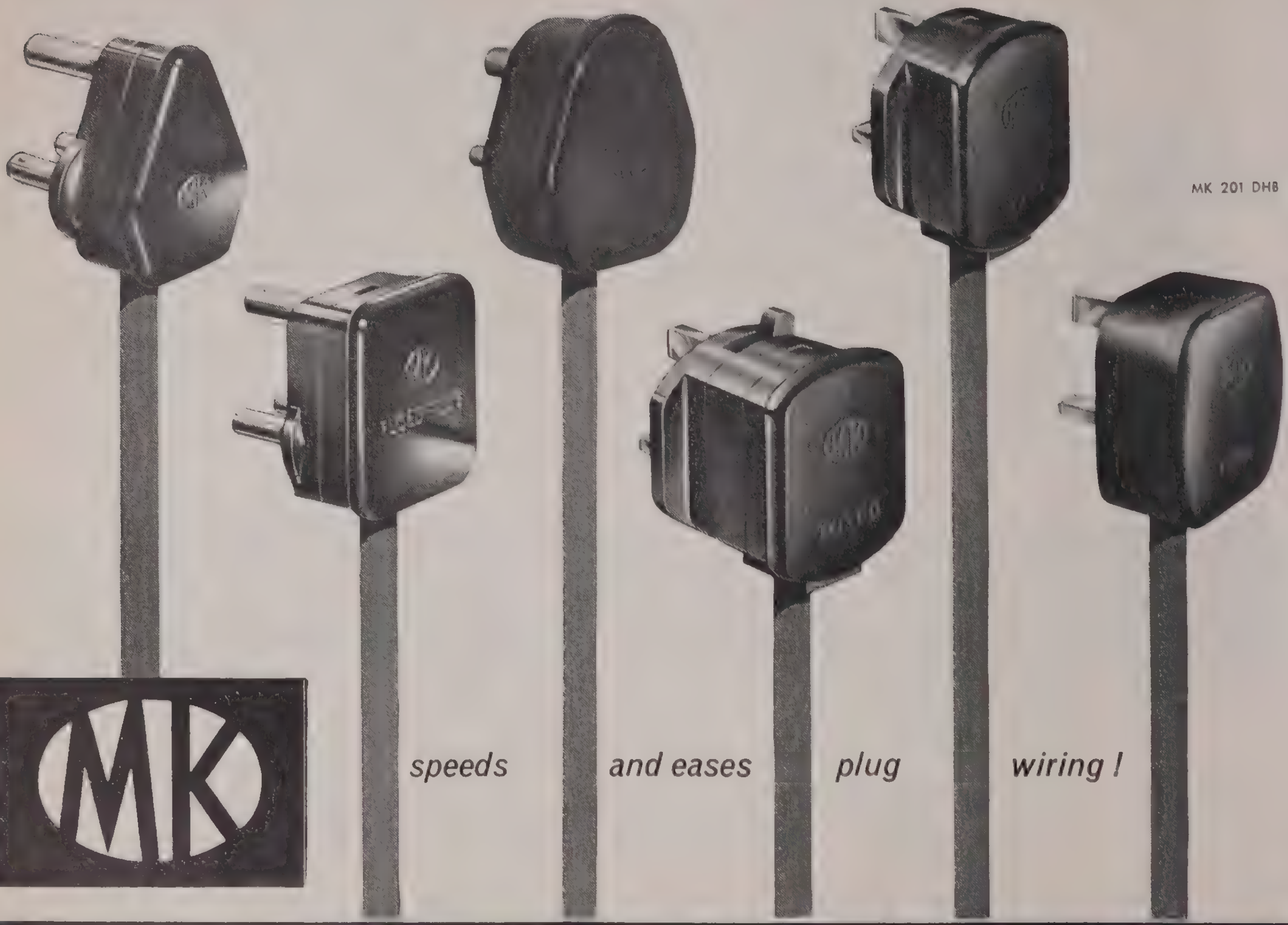
Crompton Parkinson
LIMITED

ELECTRICAL EQUIPMENT

Makers of Electric Motors of all kinds, A.C. and D.C.
Generators, B.E.T. Transformers, Switchgear, Cables,
Instruments, Lamps, Lighting Equipment, Batteries,
Stud Welding Equipment, Traction Equipment, Ceiling Fans.

CROMPTON PARKINSON LTD · CROMPTON HOUSE · ALDWYCH · LONDON · WC2
G 612

THE *feature which gives leadership in plug design!*

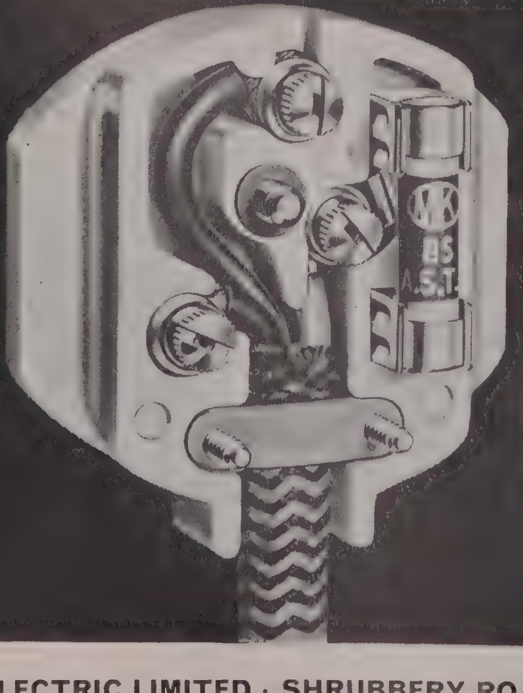


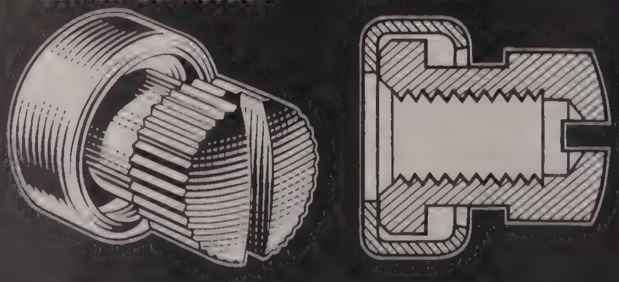
MK 201 DHB

TERMINALS HAVE ROTATING BUT CAPTIVE WASHERS

This MK feature (patent applied for) which was introduced during last year to MK 13 amp. rectangular pin plugs has now been extended to MK round pin plugs.

All MK plugs are now quicker and easier to wire. MK wrap-round terminal studs combined with heavy terminal nuts which have captive but rotating washers ensure a secure and efficient electrical connection.





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SenTerCet

'ECONOMY' RANGE of CATHODIC PROTECTION RECTIFIER EQUIPMENTS

The *SenTerCet* 'Economy' Range of cathodic protection rectifier equipments has been introduced to provide a series of simplified and economical transformer/rectifier sets for installation in non-hazardous areas, i.e. where there are no strict safety requirements for electrical equipment that is flame-proof.

All normal cathodic protection requirements are covered by the choice from nineteen variously rated equipments in the *SenTerCet* 'Economy' range.

Send for Advance Information Leaflet.

Single phase input 230/250V 50/60 c.p.s. Ambient Temperature 30° C.		
Type CP	Nominal Output Volts	Output Amps
27	50	40
28	10	200
29	30	50
210	10	140
211	50	20
212	10	80
213	30	20
214	50	10
215	10	40
216	20	20
217	20	10
218	10	20
219	10	10

Three phase input 380/440V 50/60 c.p.s. Ambient Temperature 30° C.		
Type CP	Nominal Output Volts	Output Amps
21	45	100
22	30	150
23	15	300
24	10	400
25	45	70
26	30	100

For atmospheres where explosive or inflammable gases are present, such as projects associated with the petroleum industry, equipments should be used from the approved *SenTerCet* intrinsically safe range described in STC publication No. F/CP. 50.

COMPONENTS GROUP

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A.S.E.E. EXHIBITION

Standard Telephones and Cables Limited

Registered Office: Connaught House, Aldwych, London, W.C.2

RECTIFIER DIVISION: EDINBURGH WAY · HARLOW · ESSEX

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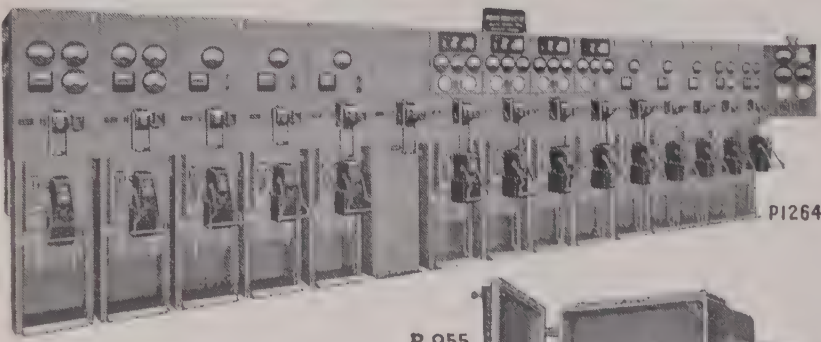
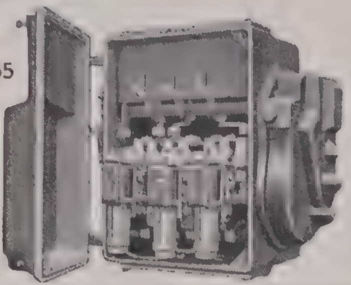
SWITCHBOARDS & HAND-OPERATED MOTOR CONTROL GEAR

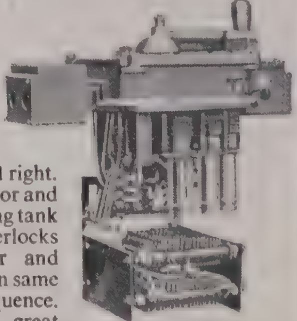

P1264

P1264 Illustrated left, Switchboard recently supplied for controlling diesel Alternator Sets and Feeders at a large Sewage Works. This Switchboard is of the duplicate busbar type and contains circuit breakers ASTA certified at 25 MVA to BS. 116 at 400 volts.

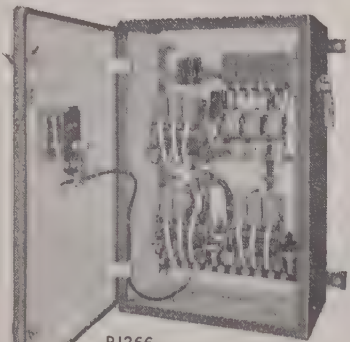
P. 955


P 955 Illustration on the right is of a hand-operated air break star delta starter, fitted with interlocked isolator and solenoid type overloads with time lags. This starter can also be supplied as a direct-on starter.

P1044 Illustrated right. Combined type stator and rotor starter showing tank removed. No interlocks required as stator and rotor contacts are on same drum in correct sequence. There is also a great saving in floor space.


P1044

CONTACTOR TYPE SWITCHGEAR & MOTOR CONTROL GEAR


P1266

P1266 Starter illustrated above is one of our CS. 30 pattern star delta starters, suitable for use up to 20 H.P. This type of starter is made in different ranges up to 100 H.P.

P1271 Illustrated right. Multi motor panel, contactor type Switchboard, comprising contactor type stator and rotor starters and star delta starters with fully interlocked isolating switches. This switchboard is one of many supplied to one of the leading Petroleum Companies.

P1271

P1267

P1267 Starter illustrated at the left is a 50 H.P. CS. 75 type stator and rotor starter. This starter is made in different ranges up to 100 H.P. All our contactors above the CS. 15 size are bar mounted with powerful magnetic blowouts.

WE MANUFACTURE :- **L.T. SWITCHGEAR 50/7,000 Amperes. E.H.T. SWITCHGEAR up to 11 kV. 250 MVA rupturing capacity. MOTOR CONTROL GEAR ¼/5000 H.P.**

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730

Reduce your press tool costs *with the* HUNTON

UNIVERSAL BOLSTER OUTFIT

Tools for piercing and forming louvres up to 8" long
Tools for piercing apertures for Painton, Belling Lee, Plessey, etc., Plugs and sockets
Punches and Dies for piercing valve holder holes
Square, rectangular and slotting

In addition to the range of Punches and Dies $\frac{1}{8}$" to $3\frac{3}{4}$" dia. available from stock, some of the tools usually required in the Radio and Electronic Industries have been standardised for use with the Hunton Universal Bolster Outfit. Illustrated here are a few which can be supplied quickly or from stock.

In London and Home Counties, ask for a practical demonstration in your own works.

Alternatively write for illustrated price list to Dept. E.R.2.

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PHOENIX WORKS, 114-116 EUSTON RD.
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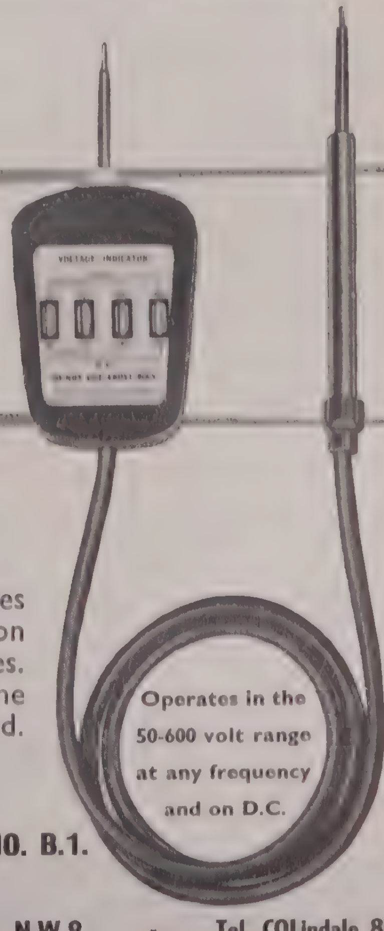
A *NEW* MARTINDALE INSTRUMENT!

THE VOLTAGE INDICATOR



Operates in the 50-600 volt range at any frequency and on D.C.

THE SUBSTITUTE FOR TEST LAMPS

TELLS YOU CONCLUSIVELY IF A CIRCUIT IS REALLY SAFE

The Voltage Indicator fits comfortably into the hand; only measures $3\frac{1}{2}$" x $2\frac{1}{2}$" x $\frac{3}{4}$"; almost unbreakable; has no moving parts. Indication is by four neon tubes which light progressively as the voltage rises. The use of a number of tubes is an additional safety factor as at the higher and more lethal voltages more than one lamp is illuminated. The instrument is fully fused and protected.
Can be used to ascertain polarity.

SEE IT DEMONSTRATED AT THE A.S.E.E. EXHIBITION ON STAND NO. B.1.

Write for illustrated leaflet to :

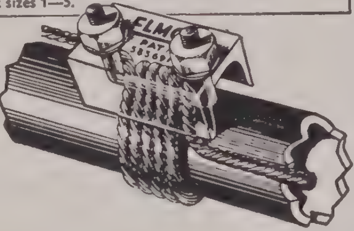
MARTINDALE ELECTRIC COMPANY LIMITED, 4 Westmorland Road, London, N.W.9. - Tel. COLindale 8642

"ELMO"

EARTHING CLAMPS

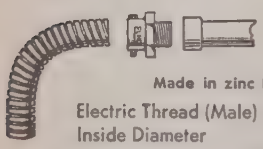
A COMPLETE RANGE TO B.S.951. 1948

IN 4 SIZES	A123	B45	C67	D8910
for earthing cables up to	7/0.036"	7/0.064"	19/0.064"	19/0.083"
to fit B.S. conduit sizes	1, 2 & 3	4 & 5	6 & 7	8, 9 & 10
i.e. in trade terms	½" to ¾"	1" and 1¼"	1½" and 2"	2½" to 3½"
NOTE ALSO: Type A123 is suitable for Earthing Cables up to 7/0.029" and for B.S. conduit sizes 1—5.				



"Elmo" Earthing Clamps are of robust construction. Impossible for wire to pull out, always under tension, therefore a most satisfactory earth and a permanent safeguard.

ELECTRICAL FITTINGS



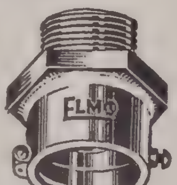
Flexible-to-rigid

CONDUIT COUPLINGS

Made in zinc base alloy in the following sizes:

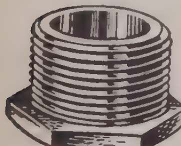
Electric Thread (Male)	⅝"	¾"	1"	1¼"	1½"	2"
Inside Diameter	⅝"	¾"	1"	1¼"	1½"	2"

Electric Thread (Male)	⅝"	¾"	1"	1¼"
Inside Diameter Flexible Conduit	½"	⅝"	¾"	1"



WITH EARTHING TERMINAL

Special Features: Integral Earthing Terminal, tinned ready for soldering. Fixing screw for continuity. Internal Threads suit all makes of flexible tubing.



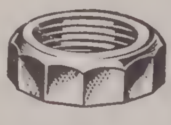
MALE
Hex. Section

CONDUIT BUSHES

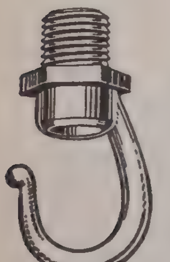
Made in the following sizes:

MALE: Electric Thread
⅝" ¾" 1" 1¼" 1½" 2"

FEMALE: Electric Thread
⅝" ¾" 1" 1¼" 1½" 2"



FEMALE
Flat Face Section for Spanner (except ¾" size which is round)

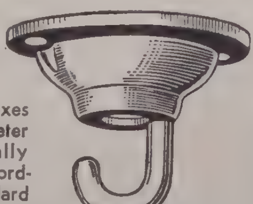


CONDUIT HOOK

For fluorescent lamps and overhead lighting fittings. Screwed ¾" thread, male electric. Made to fit all standard boxes with two holes 7/32" diameter—2" centres diametrically opposed. Designed in accordance with British Standard Specification.

CEILING PLATE

One hook



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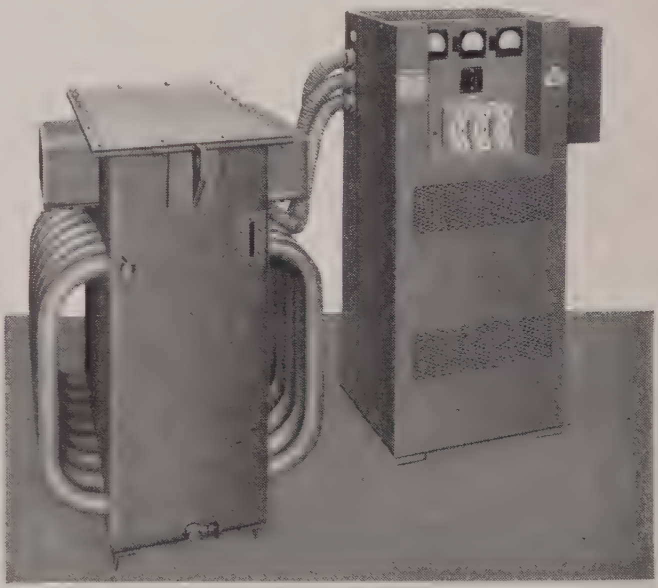
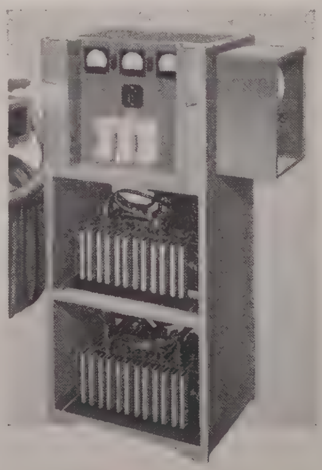
RECTIFYING EQUIPMENT

Legg design and manufacture rectifying equipment for all purposes where Direct Current is required from an A/C source.



3 phase Oil Immersed Transformer with Control panel and naturally cooled silicon rectifier supplied for overseas port installation for use under tropical conditions.



CONTROL PANEL AND SILICON RECTIFIER.

Legg design and manufacture the largest range of Battery Charging Equipment for Electric Vehicles and Trucks. Legg also design and manufacture Transformers and Rectifying Equipment incorporating Silicon, Germanium and Selenium Rectification.

For full specification and details write to:—

LEGG (INDUSTRIES) LTD., WILLIAMSON ST., WOLVERHAMPTON.

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Selecta-mho has been specially designed for those systems in which the utmost economy is essential.

Saves on first cost, which is less than half that of conventional systems.

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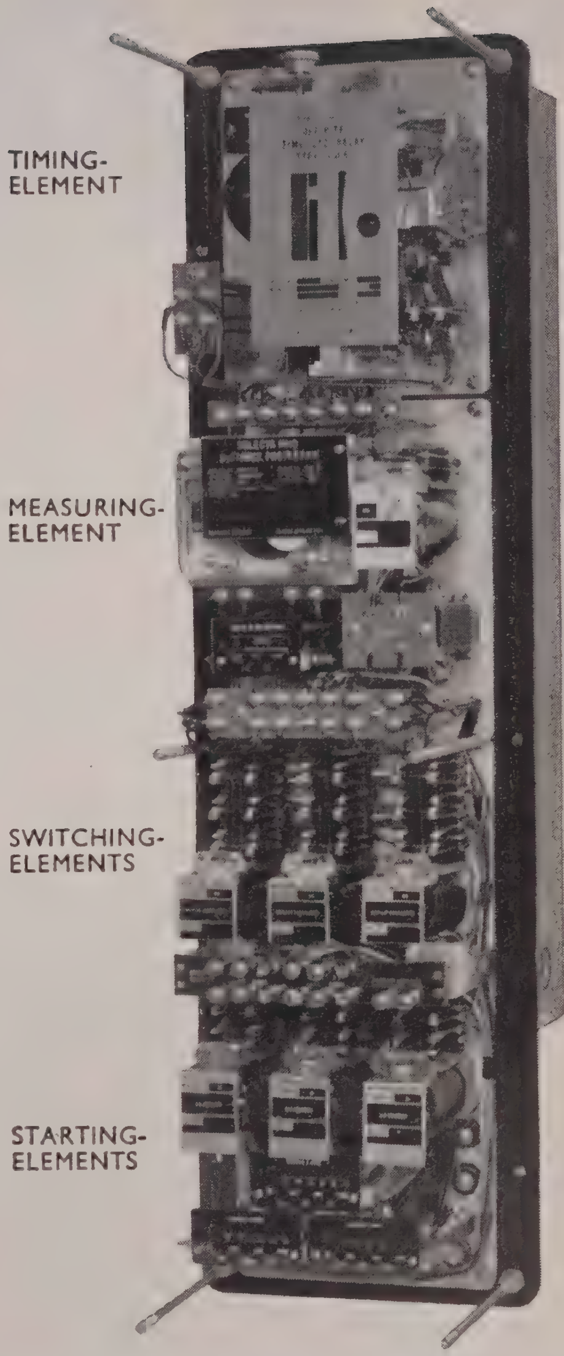

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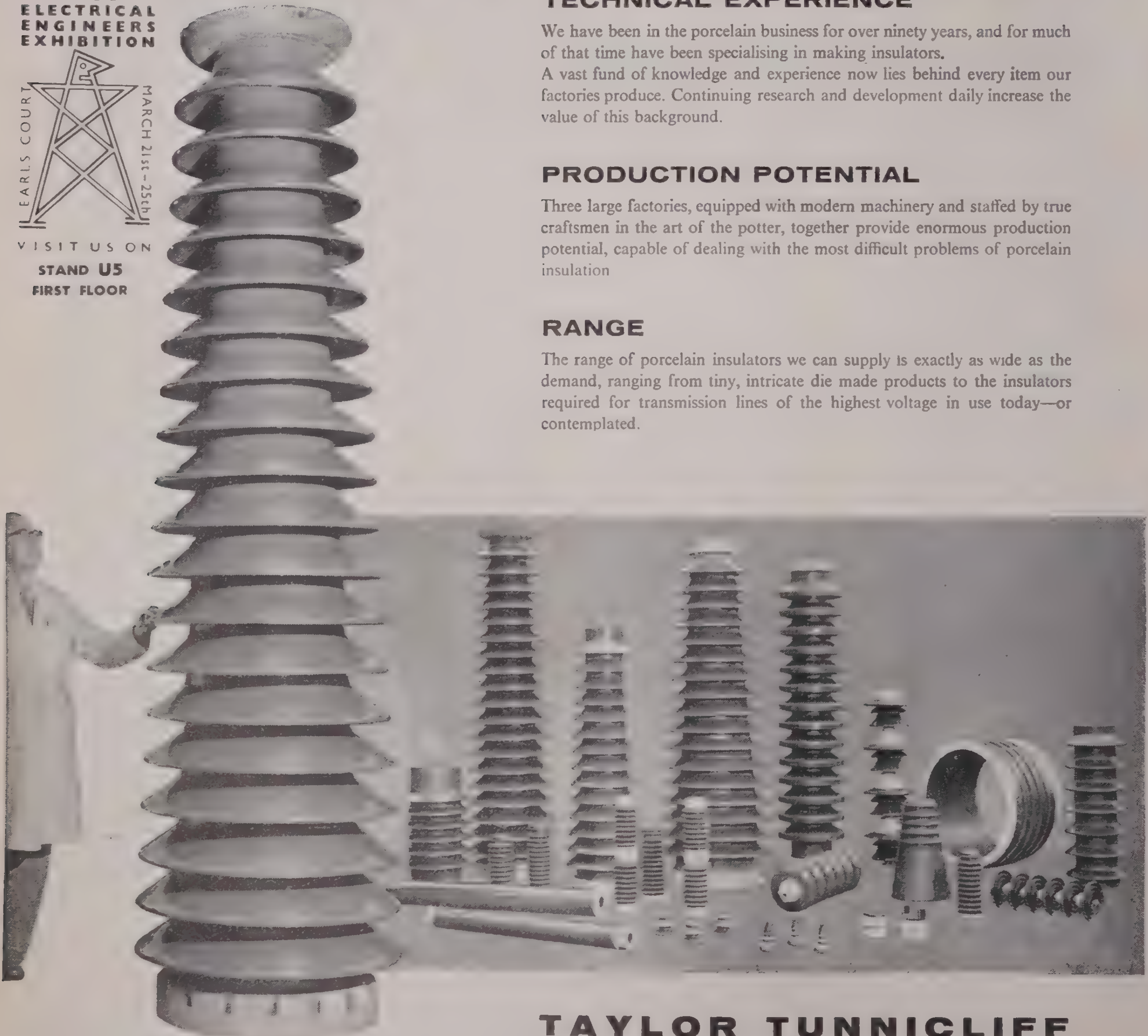

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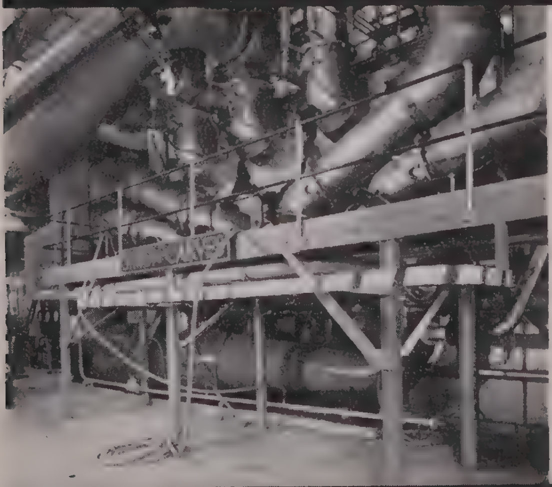
So said Mr. Richard Wood, the Minister of Power, at the inauguration of Britain's first once-through supercritical forced-circulation boiler. Designed and built by Simon-Carves at the Margam works of the Steel Company of Wales, it marks a major advance in large-scale steam generating practice.

The steam conditions of 3300 p.s.i. and 1060°F are the highest yet commercially used in Great Britain. The associated back-pressure turbo-alternator gives an output of 9500 KW (approximately 30% increased on the installed capacity of the existing generation plant). Process steam is exhausted at 650 p.s.i.g. and reheated to 820°F to serve the new turbo-blowers and the existing system.

Whether generating steam at pressures above or below the critical pressure, the O T boiler has many advantages over conventional natural and assisted circulation boilers. These are explained in the brochure 'OT Forced-Circulation Boilers by Simon-Carves Ltd'.



left. The operating front of the boiler is housed in the turbine building. Fuel can be blast furnace gas or fuel oil or a mixture of both.

right. The central control panel. From here, both the boiler and the high pressure turbines are controlled.

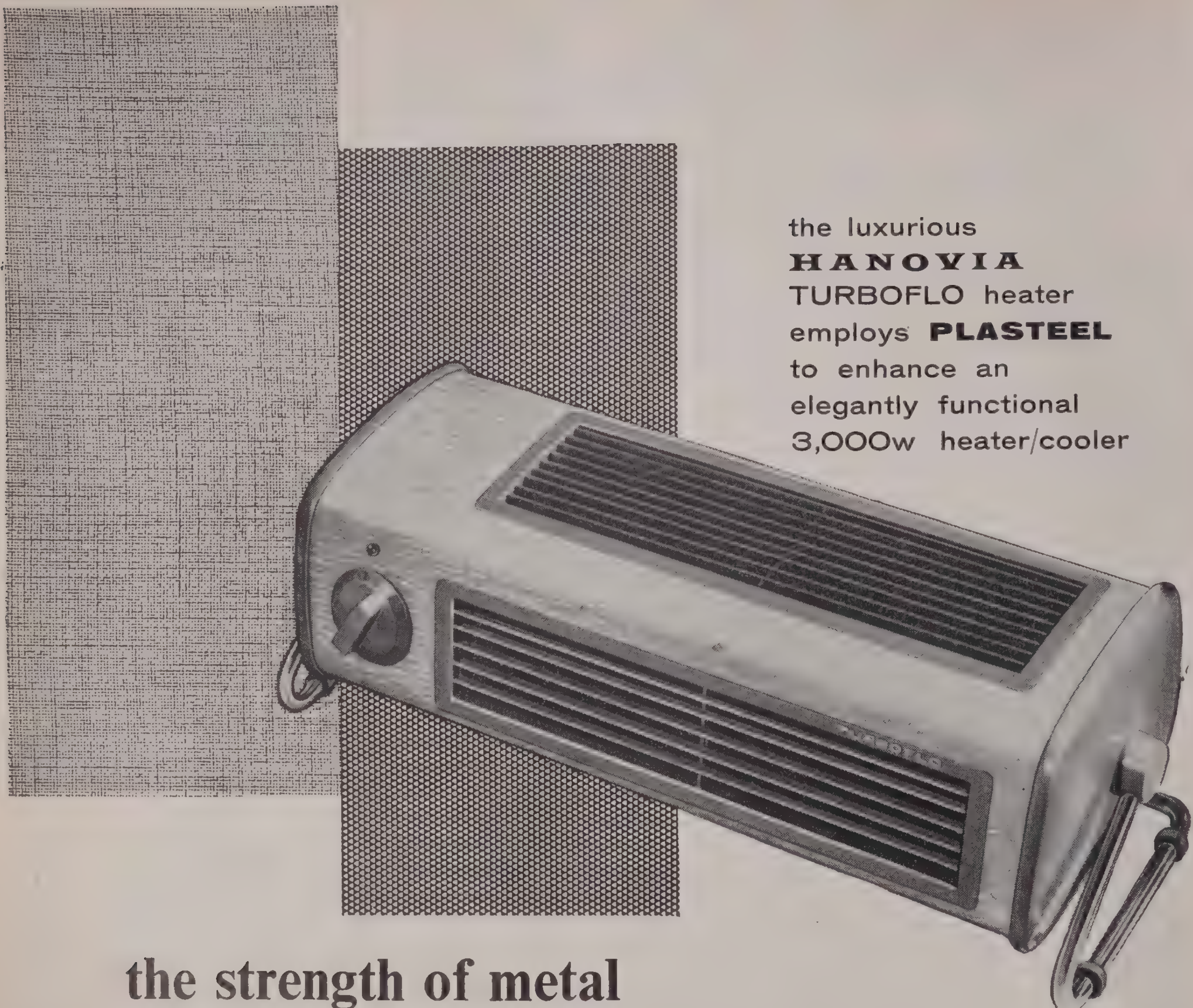
O T FORCED-CIRCULATION BOILERS BY

Simon-Carves Ltd

MEMBER COMPANY SIMON ENGINEERING LTD

CHEADLE HEATH, STOCKPORT · *AND AT CALCUTTA · JOHANNESBURG · SYDNEY · TORONTO*

SC 252/PS



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HANOVIA
TURBOFLO heater
employs **PLASTEEL**
to enhance an
elegantly functional
3,000w heater/cooler

the strength of metal
married to the beauty and durability of PVC

The Hanovia Turboflo, shown above, is a typical example of the use made in the newest and most advanced designs of the latest metal finishing materials—vinyl plastic bonded to steel or aluminium. Named Plasteel and Plasminium, these new materials can be formed and deep drawn as easily as the basic metal and produce a finished article straight from the tools—saving the time and floor space taken for less modern finishing methods. In a basic range of attractive colours and designs, the plastic coating is also available in textured finishes such as wood and leather, and even in tartan effects. Plasteel and Plasminium are supplied in coils or flattened lengths ranging from ½″ to 18″ in width with metal thicknesses from 30 s.w.g. to 18 s.w.g. Write for full details and samples of new Plasteel and Plasminium.

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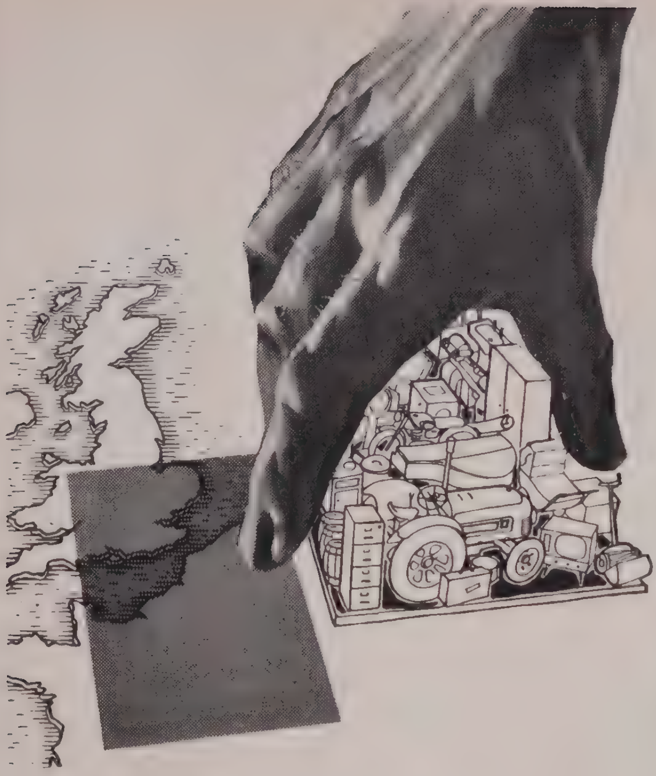

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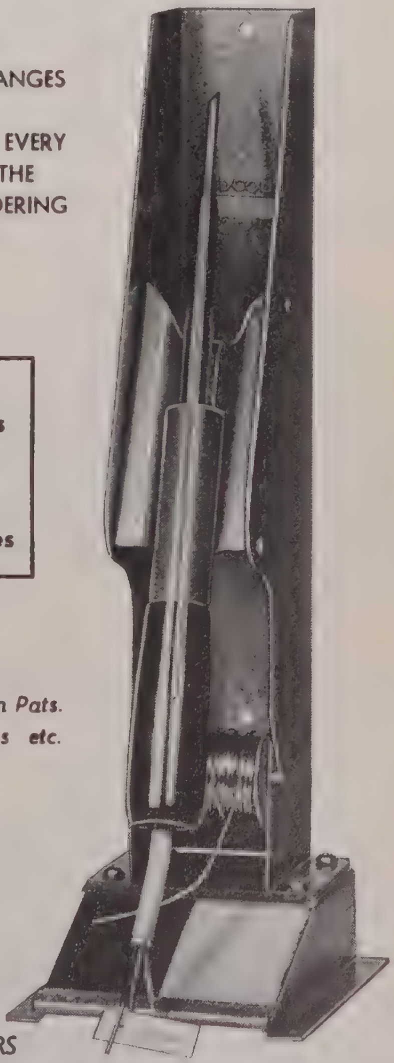
The instruments with the correct soldering temperatures

British and Foreign Pats. Registered designs etc.



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GAUDEN ROAD, CLAPHAM HIGH ST.,
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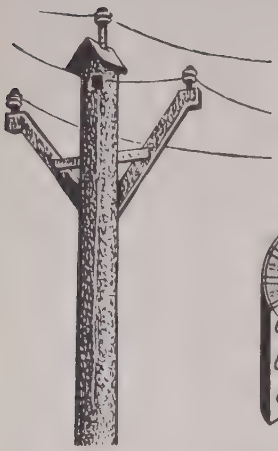
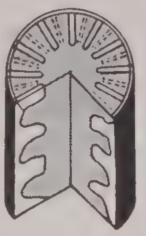
poles last 15-20 years longer with COBRA

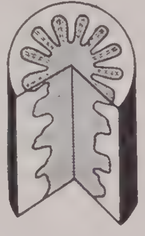


Note staggered placing of injections, made by means of thin tool steel needles which merely part the fibres—nothing is taken from the pole and strength is maintained.

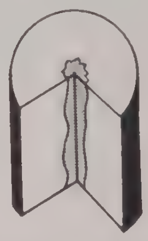
▨ Unprotected wood
☐ Cobra salts
■ Coal tar seal



Preservative spreading outward from all the concentrated deposits, giving complete penetration of the sapwood.



Intermingling diffusion of the SALTS from all injection planes and continued penetration into the heartwood



Continued penetration to the heart with SALTS adhering to wood cells as a *stable protection*.

The detection and treatment of decay and rot, to be economically effective, requires specialist knowledge and attention. Cobra experts inspect and report, in detail, on each pole individually. All equipment, operators and transport are provided by the Cobra service. Cobra treatment is carried out without interruption to the normal operation of the overhead lines.

Cobra salts are applied at ground line area, the most vulnerable part of the pole, and penetrate to the same depth as moisture.

Over ½-million poles in the U.K. have been effectively treated by Cobra.

Cobra
POLE RE-IMPREGNATION

AFFILIATED COMPANIES IN HOLLAND, BELGIUM, SWITZERLAND, FRANCE, SPAIN, CANADA, U.S.A., ITALY

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NEWCASTLE-UNDER-LYME
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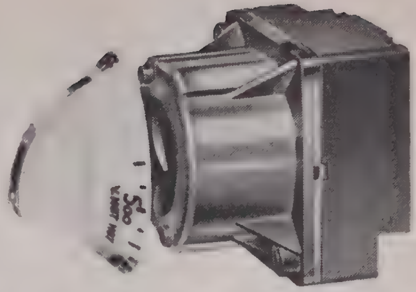
20 TH THERMOSTAT

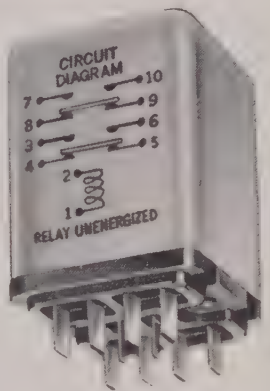
A single pole, single circuit hydraulic slow break instrument rated at 16 amp. 250 v. A.C. Shallow projection easy wiring, rear terminals, positive indexed OFF.



'DIAMOND H' CONTROLS

GENERAL PURPOSE RELAYS

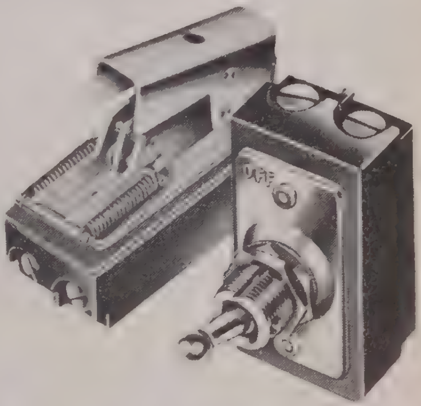
25 amp. 250 volt A.C. double pole double throw, compact only $1\frac{1}{2}'' \times 1\frac{1}{2}'' \times 1\frac{7}{8}''$. Silent. Plug in, solder tag, or fast-on terminations, coils available for 4-250 V. A.C. 50-60 cycles and 4-250 V. D.C.



FOR DOMESTIC

TOGGLE SWITCHES

Rated at 6,10 or 20 amp. 250 V. A.C./D.C. for 1 hole fixing or base mounting. Trigger operated switches available in the 6 and 10 amp. sizes.

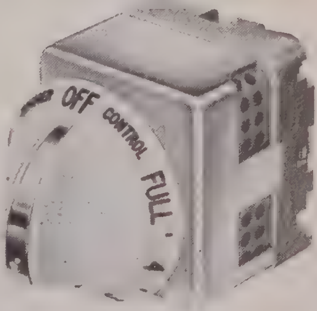


AND INDUSTRIAL APPLICATIONS

The complete range of 'Diamond H' products are displayed on our stand at the A.S.E.E. Exhibition

ENERGY REGULATORS

Rated at 15 amps, 200/250 volts, AC. This unit has been designed to meet modern cooker applications. Available for single pole, single circuit; single pole, single circuit with pilot light; also double pole, single circuit.



'DIAMOND H' SWITCHES LTD.

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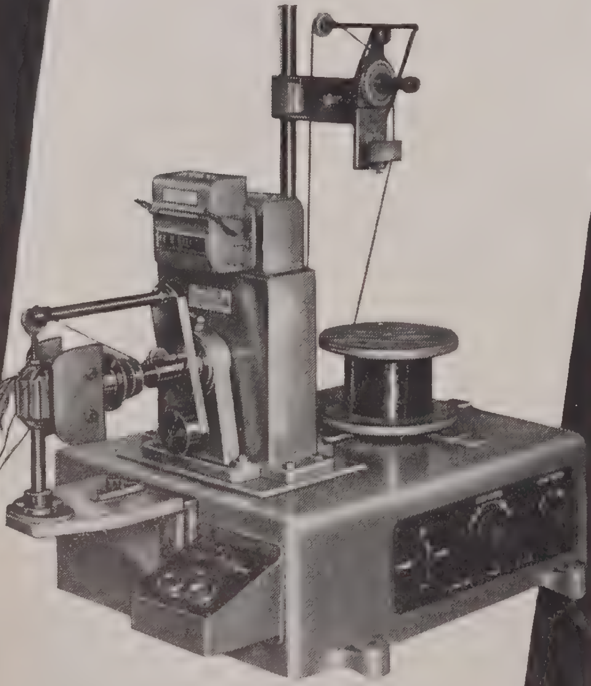

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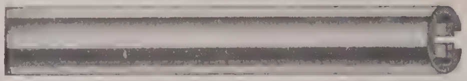

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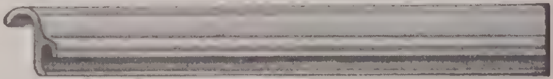

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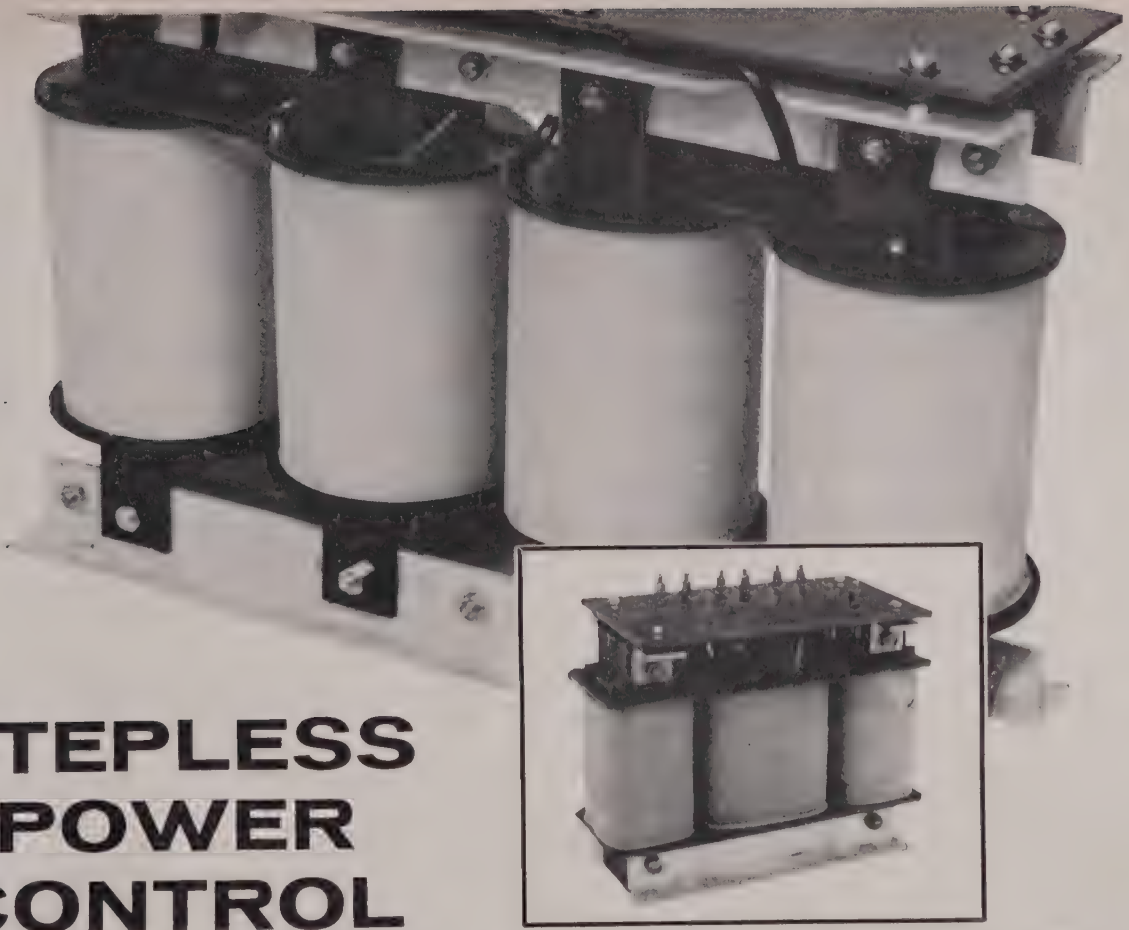

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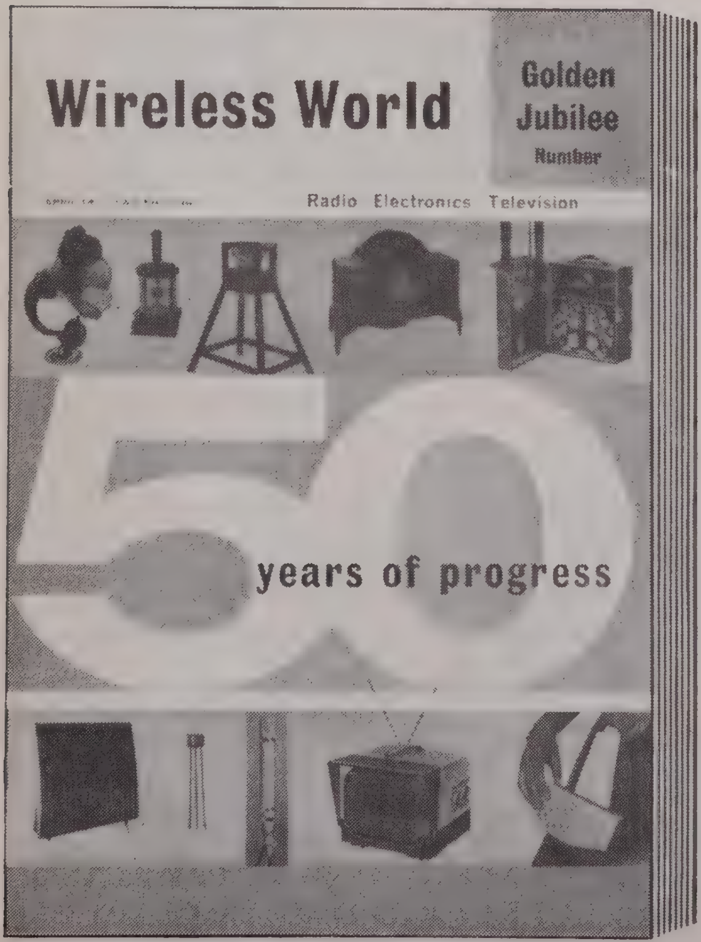

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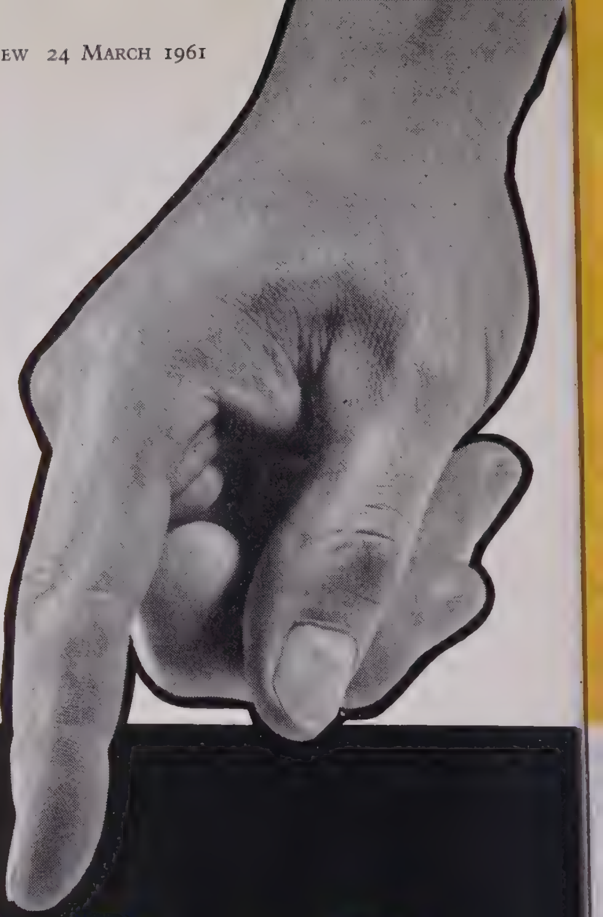

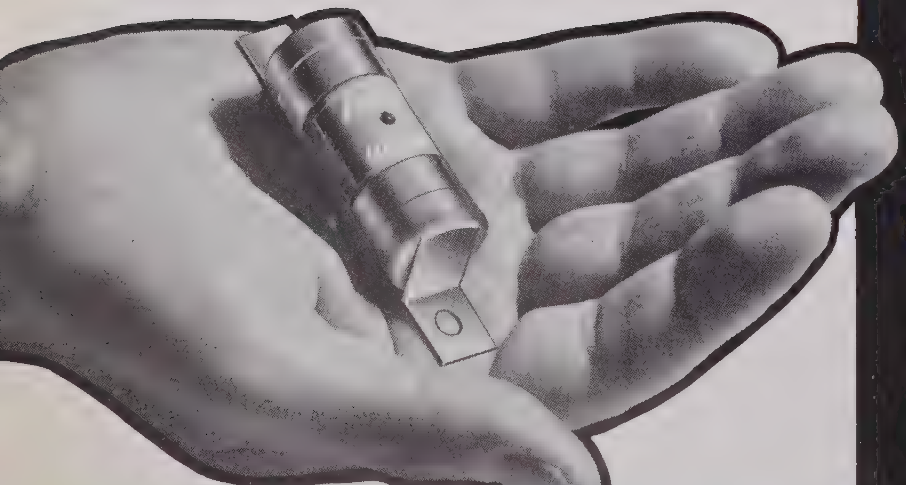

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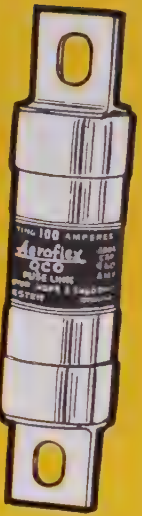

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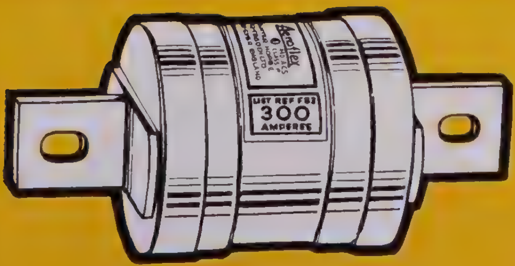

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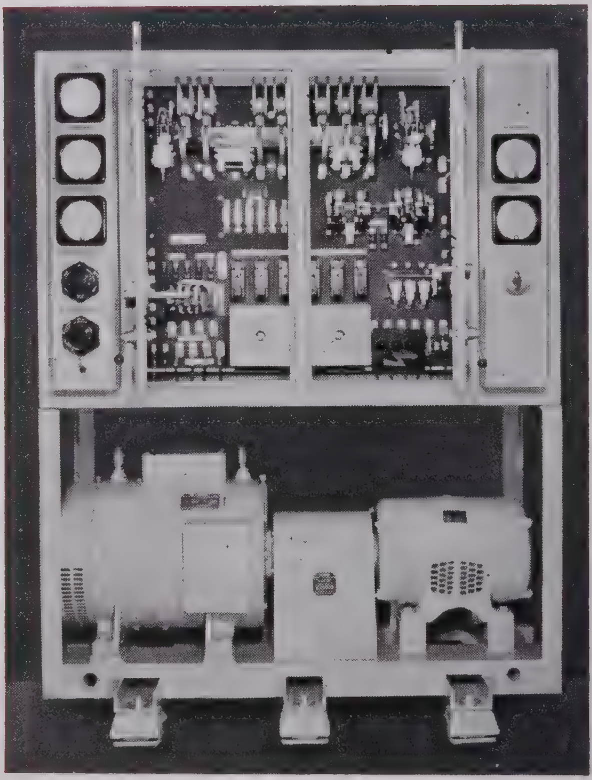

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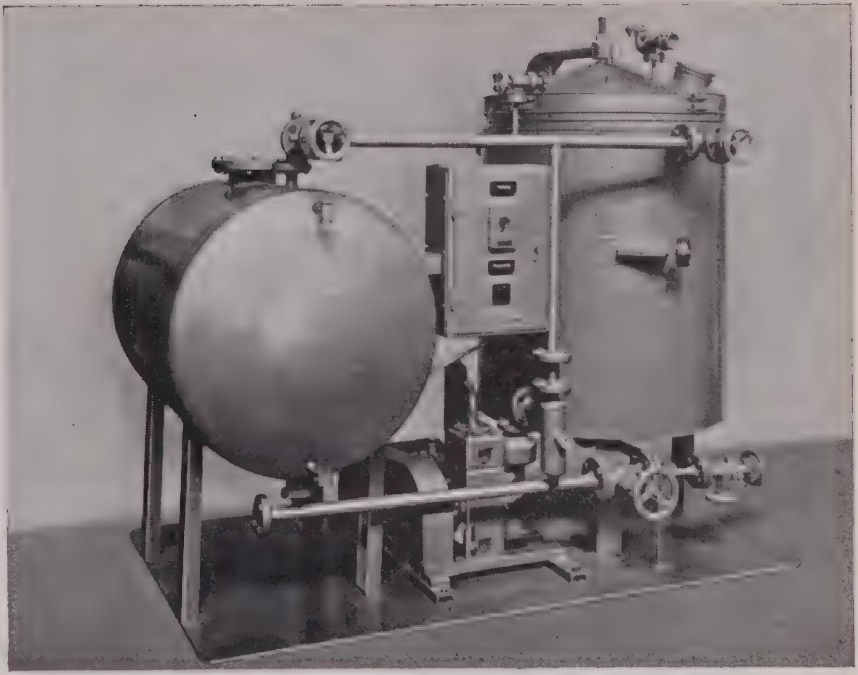

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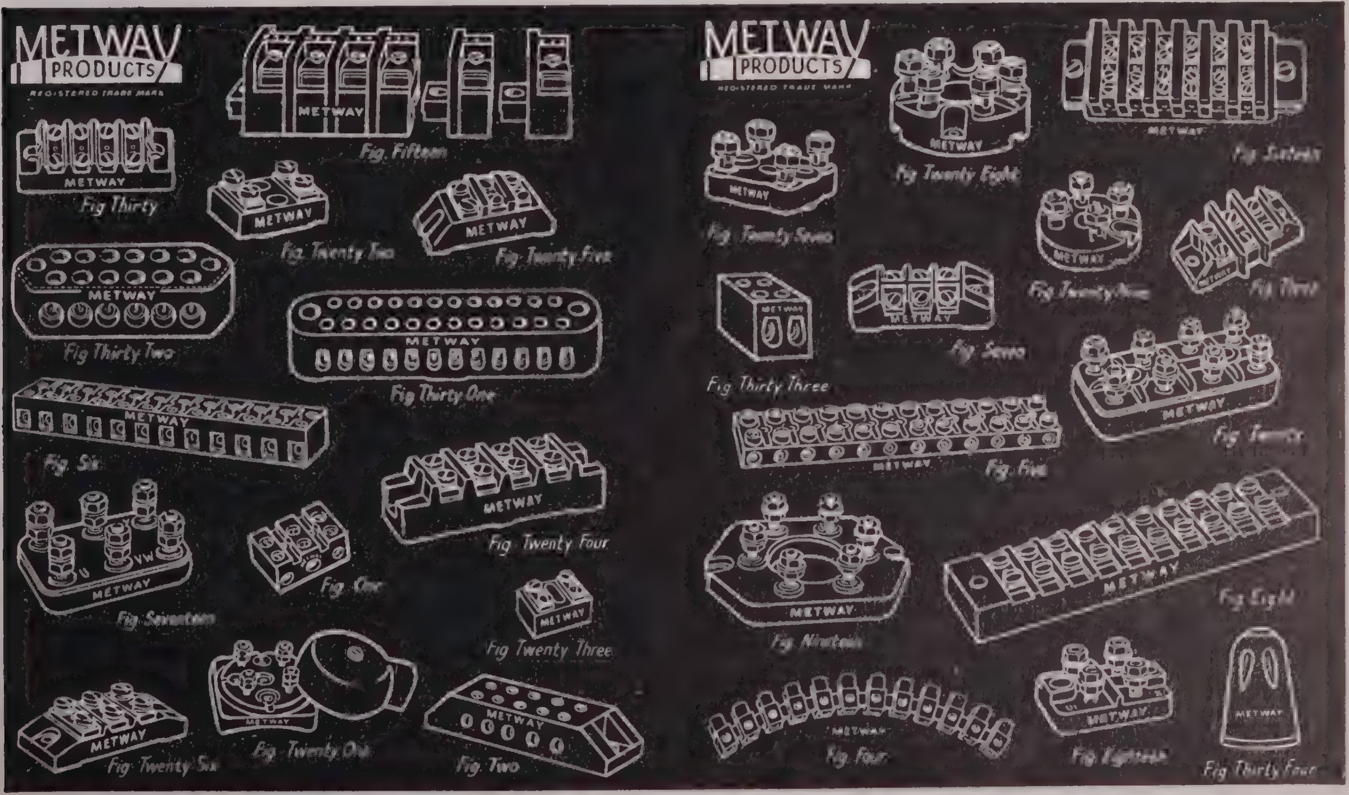

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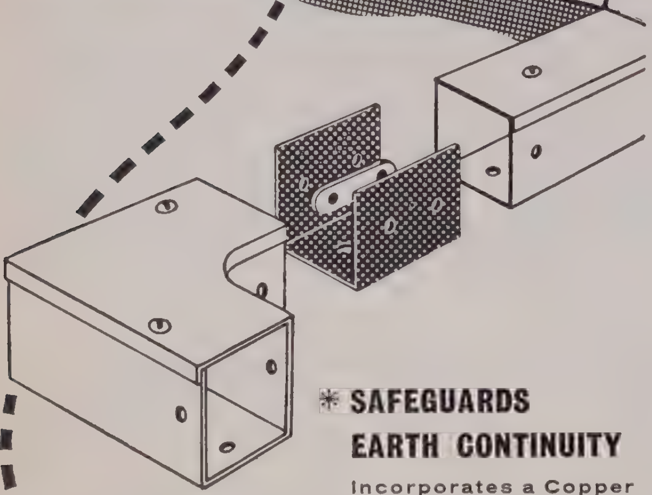

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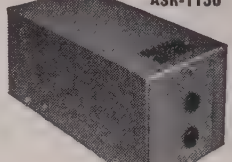

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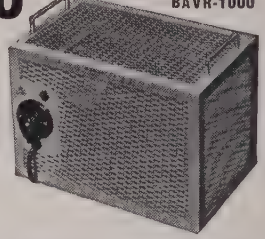

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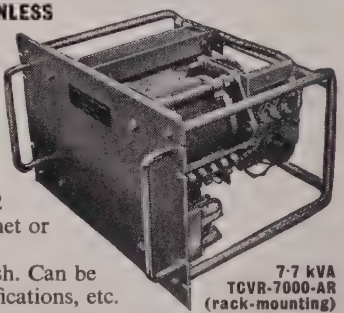

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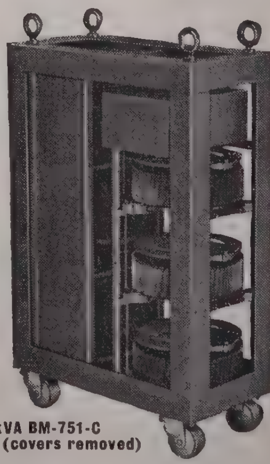

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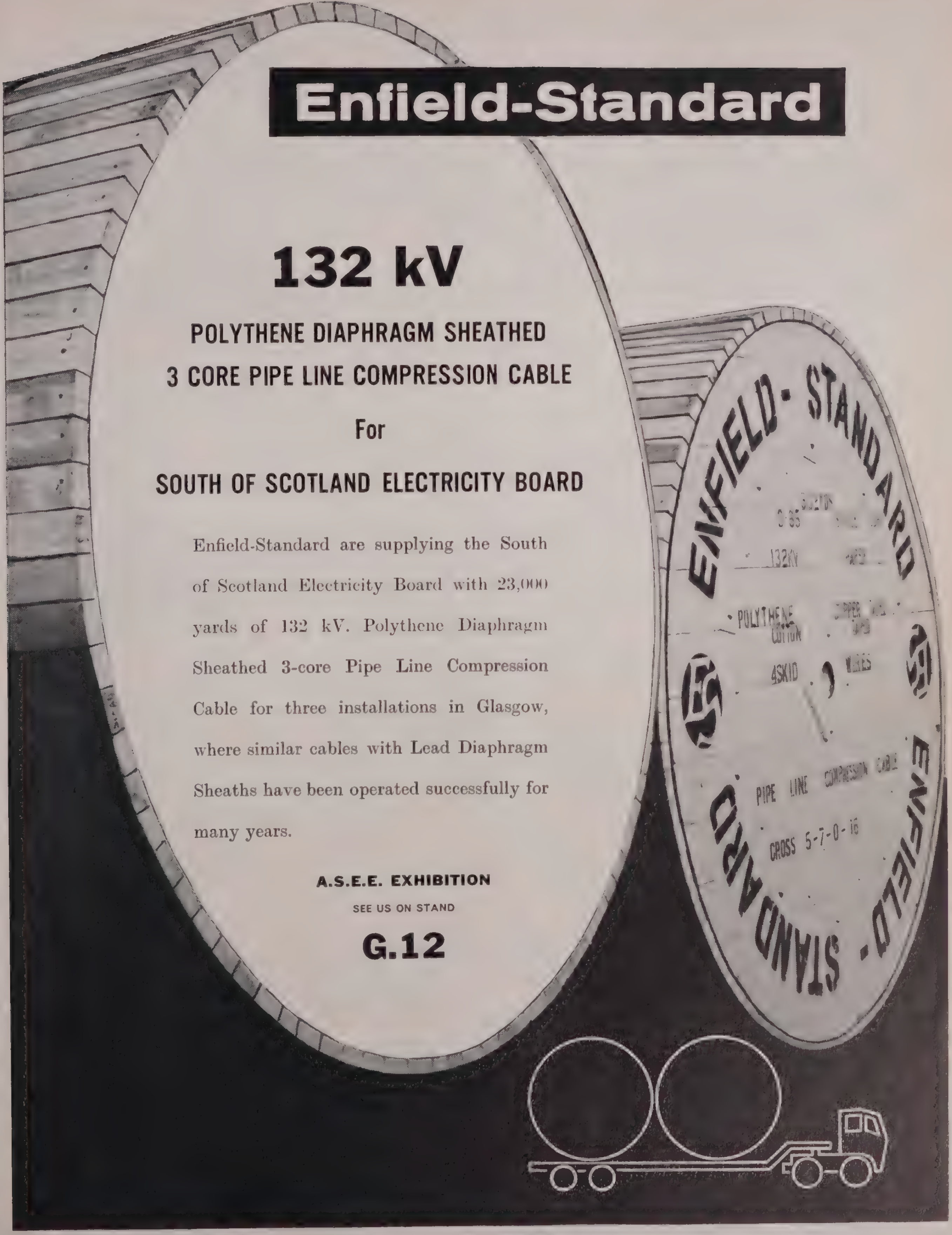

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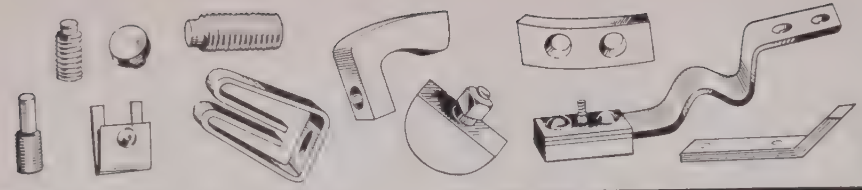

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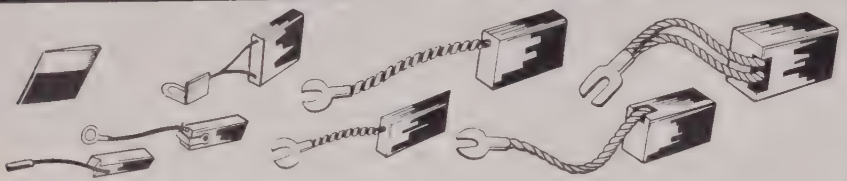

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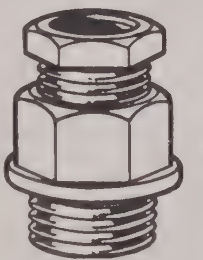

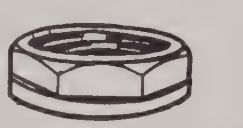

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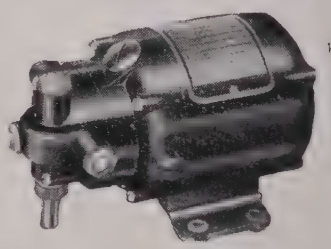

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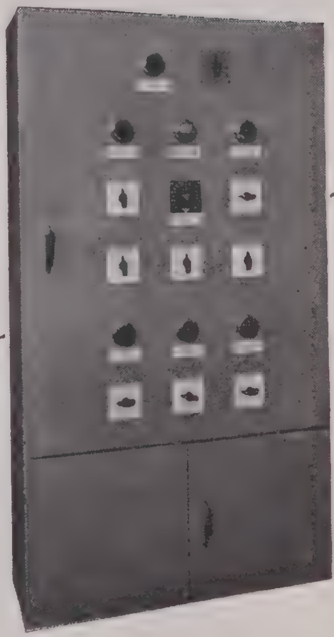

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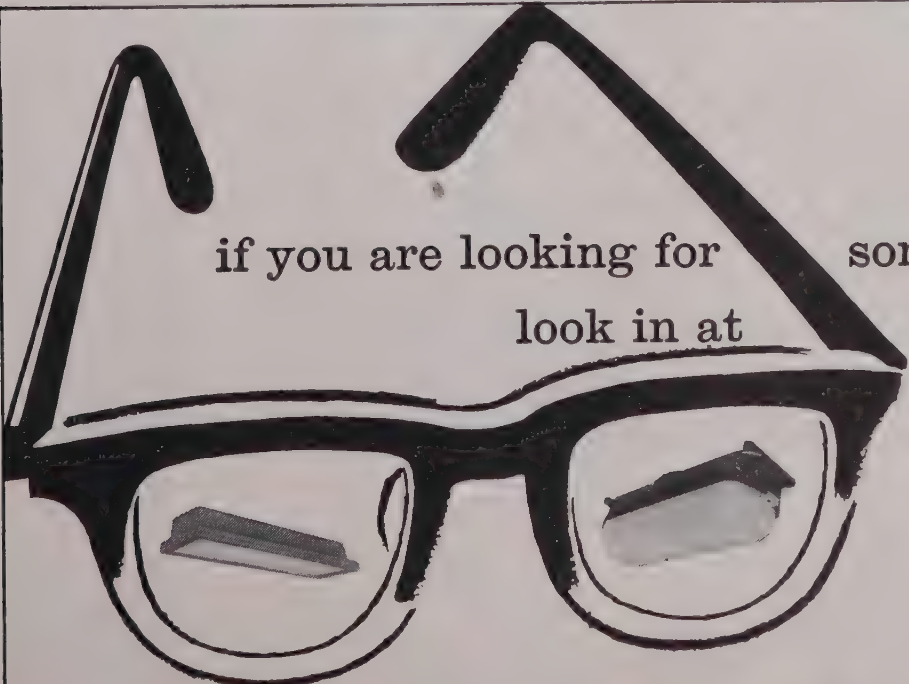
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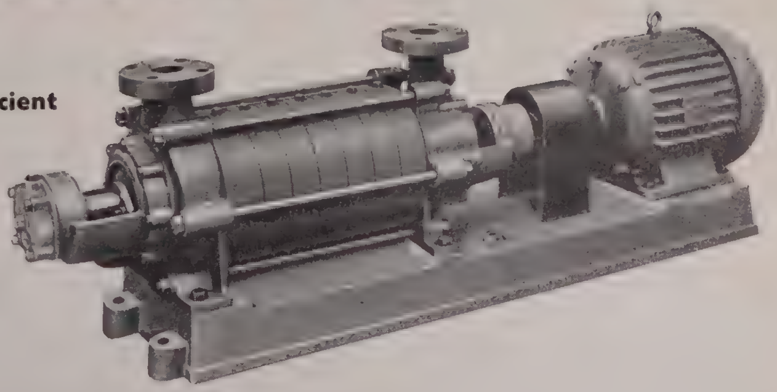

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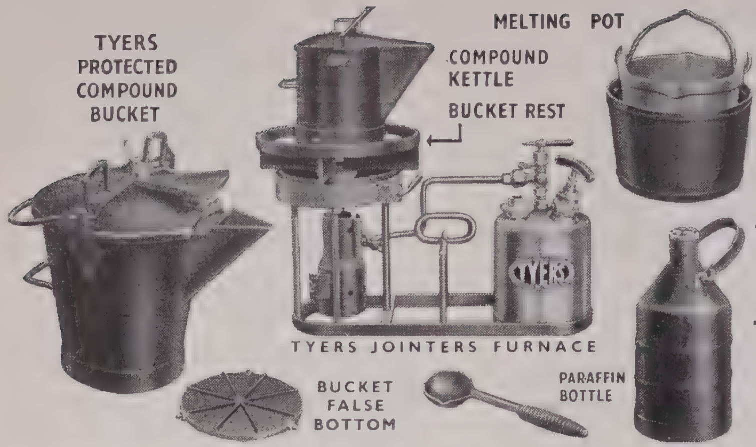

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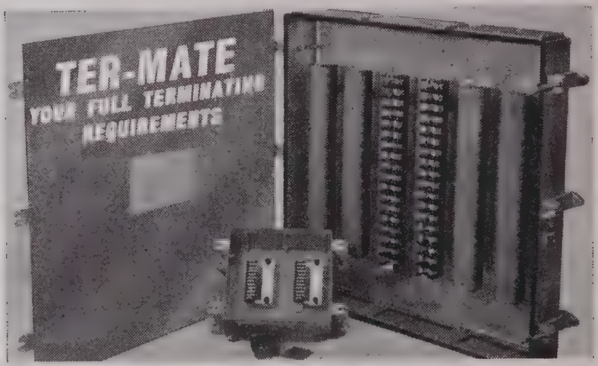

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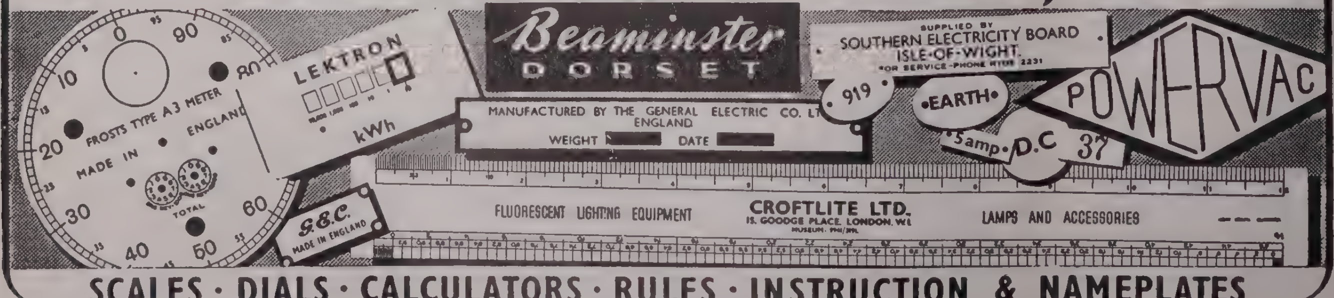

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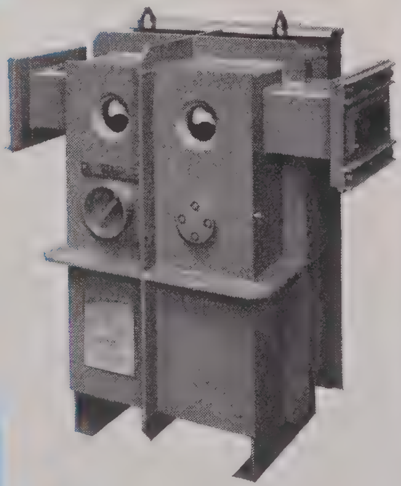

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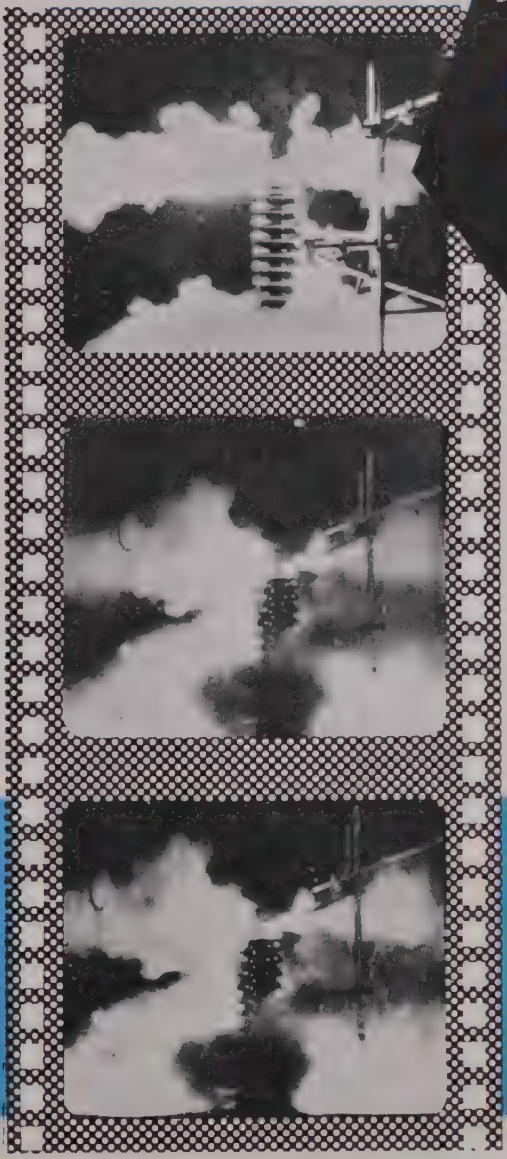
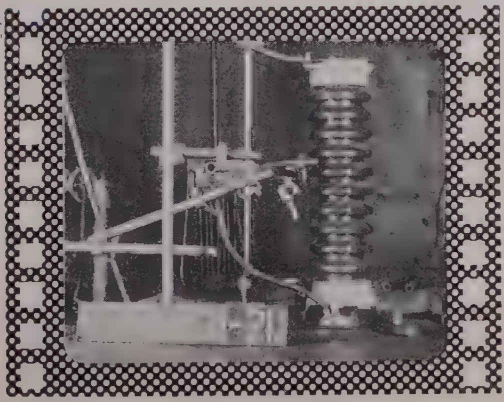


Here's further proof why you should specify EMP Heavy Duty Arresters. The Frames on the left have been taken from a high speed motion film. These pictures show EMP Heavy Duty Arresters, with internal parts deliberately damaged, then subjected to a symmetrical rms current of approx. 20,000 amps. (41,600 amps. peak). It is clearly shown that the arrester housings survived this fault with all parts completely intact. Should an arrester fail—due to unforeseen conditions—its ability to remain physically intact may save costly damage to adjacent equipment. Make sure—specify EMP Heavy Duty Arresters.

EMP heavy duty arresters on test survive an immense fault current and remain . . .



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FG.59

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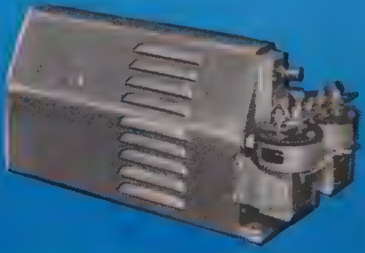
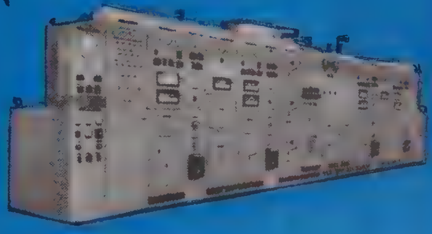

Carbon stack controller for battery-operated vehicles.

Control desk for multiple M.G. set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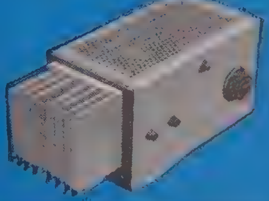
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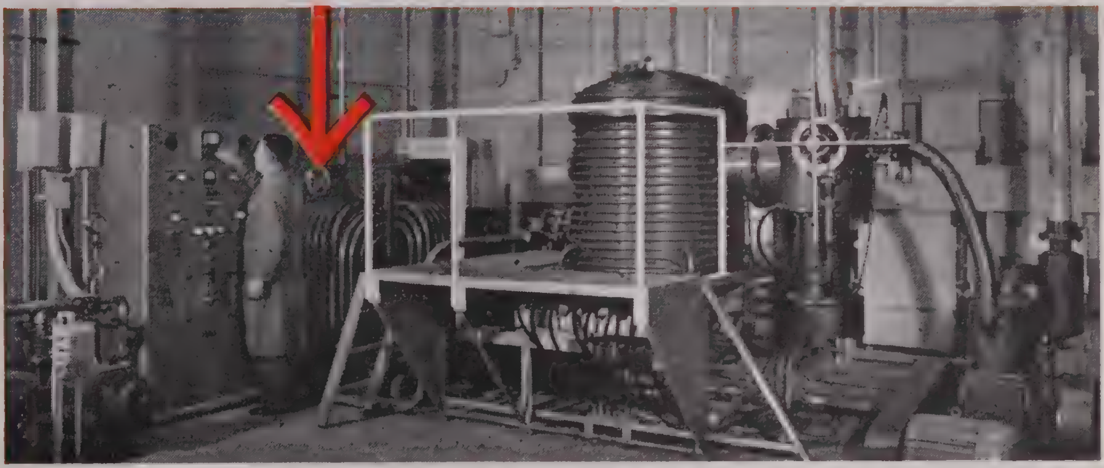

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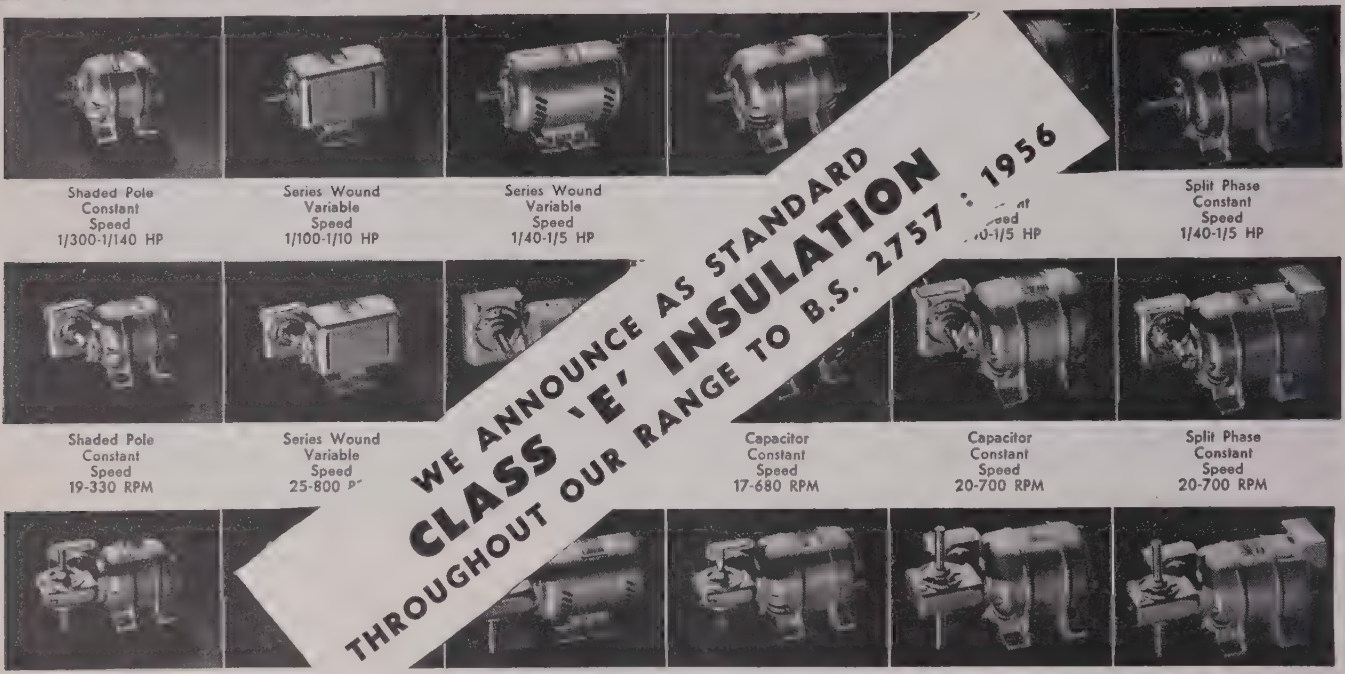

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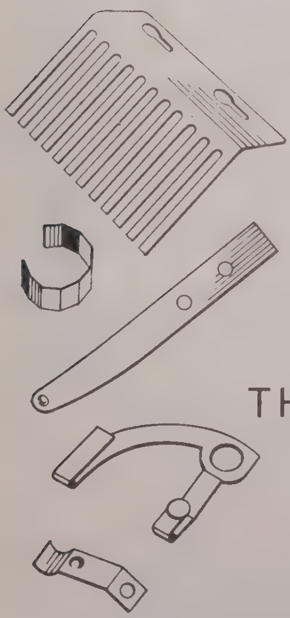

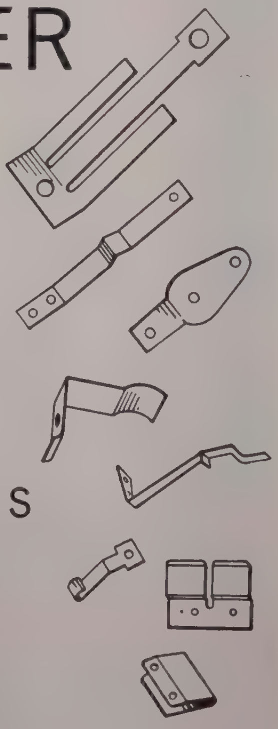

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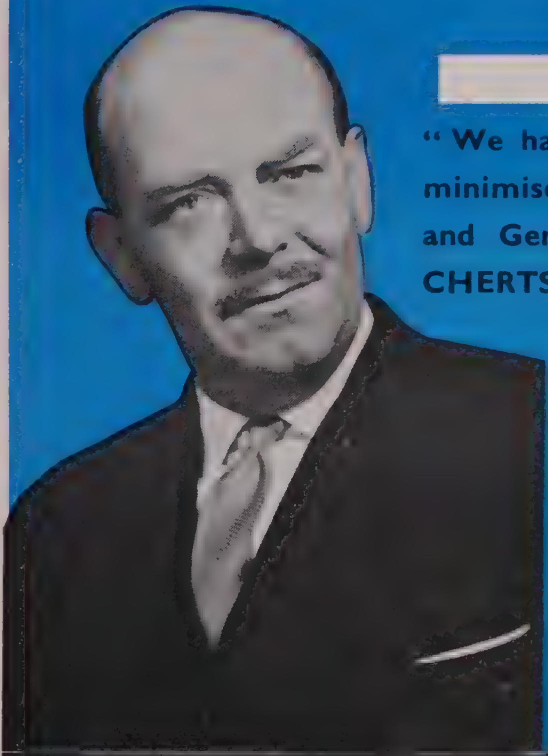

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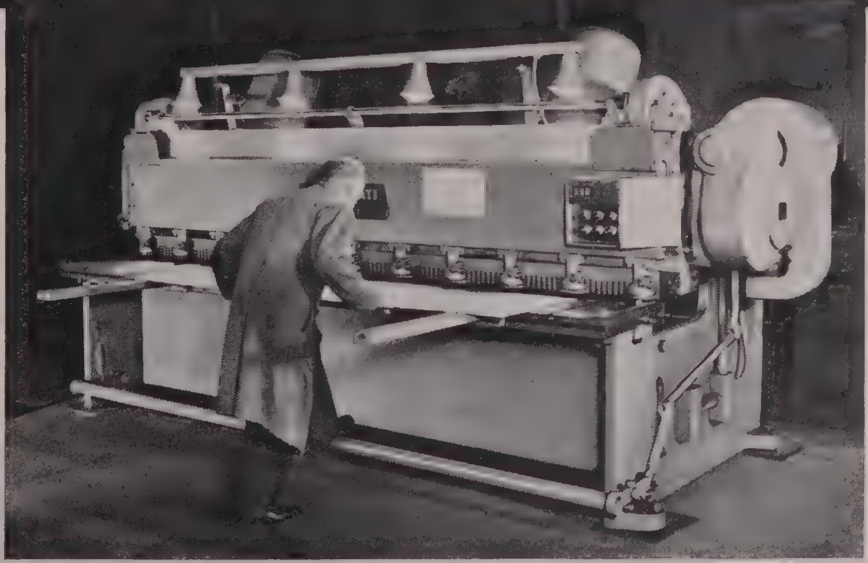

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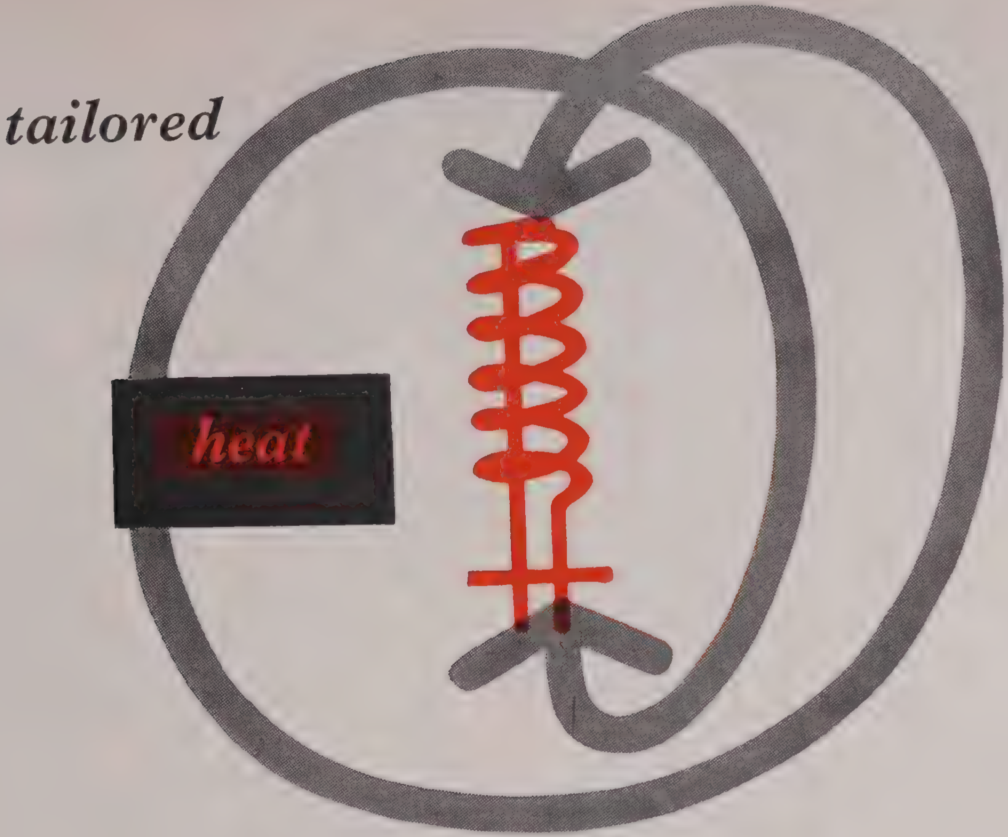

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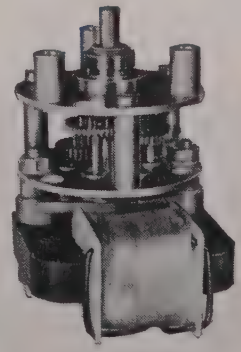

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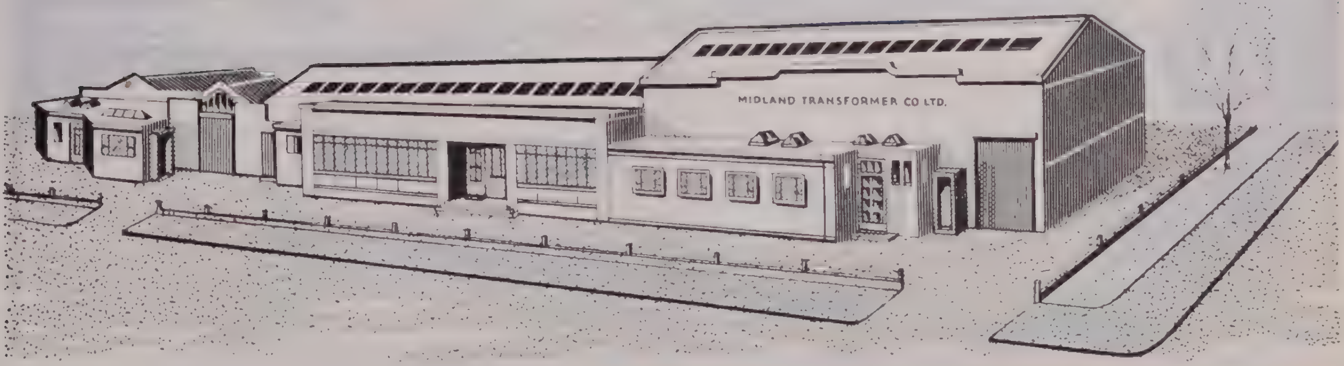
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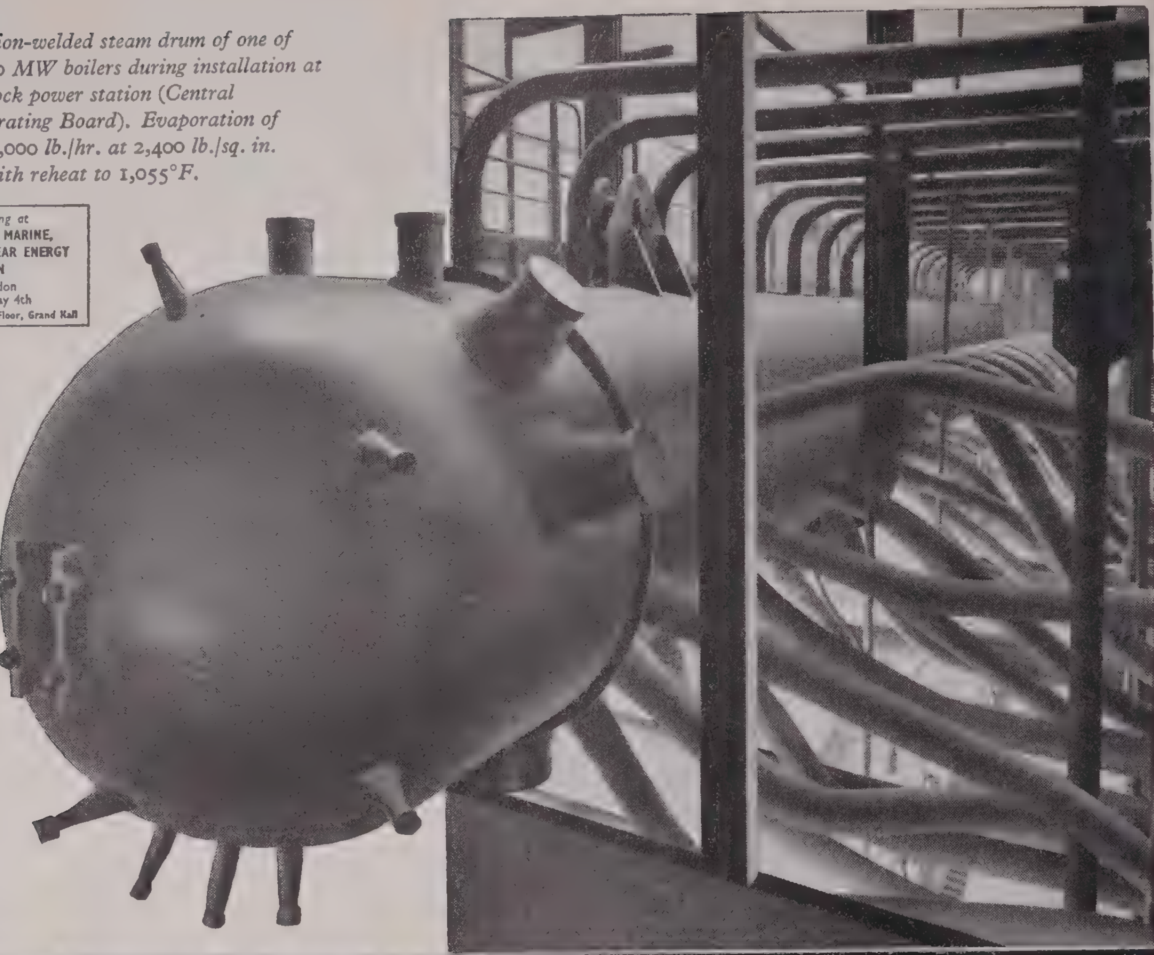

The age of STEAM

This is the age of *steam*. For some it may be the electrical age. For others, the atomic age. But nearly all our electrical power is *steam*-generated — over 98% of it, in Britain, and over 80% of it throughout the world; and atomic power is available in useful form only through the medium of *steam*.

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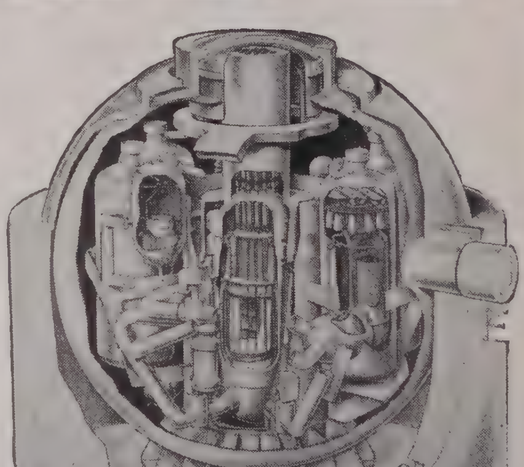

Cut-away view of a Babcock water-cooled nuclear reactor and steam-raising equipment, with an evaporation of 615,000 lb. of steam/hr., for nuclear ship propulsion; also applicable to electrical-power generation.

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STEAM RAISING PLANT

ELECTRICAL REVIEW

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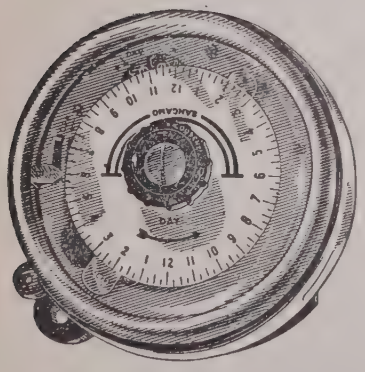

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SW80

ELECTRICAL REVIEW

24 March 1961 Vol. 168 No. 12 Established 1872

The Exhibition

ELECTRICAL engineers are overwhelmed by the large number of exhibitions, shows and displays directed to their attention. A professional engineer, although he may be engaged in the heavy electrical industry, has to take a serious interest in the many light current techniques which are finding an increasing number of applications in his branch. There is no doubt that to keep abreast of such developments he could find some item of interest at most borderline exhibitions. But because of the complexity of some of these exhibitions the time involved in a personal visit is not usually very worth while. In fact, many of the ever-increasing number of exhibitions contribute very little and detract from those already established. The Electrical Engineers Exhibition, however, is an annual event which no one in the profession should miss. It is being held at Earls Court and closes tomorrow, Saturday, at 7 p.m.

Last week we published a stand-by-stand " preview " and in this issue we survey the principal exhibits to indicate the trend of developments. It will be seen that the display covers the whole field of heavy electrical engineering and also includes examples and applications of light current techniques. As the theme of this year's exhibition is communications, light current apparatus is more in evidence than usual. Many of the smaller firms find it difficult to participate in all relevant exhibitions but, with over 470 exhibitors at Earls Court, the electrical engineering industry is as fully represented as possible.

For the practising electrical engineer there is nothing to replace seeing the actual equipment and, in many cases, watching demonstrations. The professional engineer rarely gets the opportunity of seeing such a wide variety of equipment and, at Earls Court, he is also able to make comparisons of similar devices produced by different manufacturers. It would, of course, help if all manufacturers of a particular type of apparatus were situated on adjacent stands. This is probably impracticable in many cases, but there seems to be no reason why lighting fittings manufacturers, for example, could not be localised.

Although there are very few entirely new developments to be seen at this year's exhibition, there are many examples of new designs and new applications of conventional equipment. Many firms are, of course, spending large sums of money on development and research programmes but it often takes many years to translate the results of this work into production equipment. The exhibition shows, however, that the results of past research and development work have strengthened the world-wide British lead in the design and manufacturing of electrical equipment. It is, of course, only by being ahead of the field in research and development that the volume of British exports can be maintained or increased.

STATE CORPORATION SALARIES

Some stir has been caused by the announcement of the appointment of Dr. R. Beeching (Imperial Chemical Industries) as the head of the new railway organisation at a salary of £24,000 a year—which is what I.C.I. are paying him. The main point of argument is the wide difference between this amount and the £10,000 a year received by the chairmen of other national corporations, e.g. the Electricity Council, the Central Electricity Generating Board and the Atomic Energy Authority. Actually the disparity is not so big as it looks because of the excessive taxation to which these salaries are subject.

On the one hand it is contended that if leaders of industry are to be attracted to the public services they should not suffer financial loss. On the other, it is argued that if there is a " rate for the job " it should be adhered to in all cases; if it is inadequate to secure the best men it should be raised. In our opinion it is anomalous to institute flat rates for board chairmen. There are vast differences in the responsibilities and worries connected with the various nationalised industries and services. In his new job Dr. Beeching will probably be taking on the maximum of both.

STIMULATING EXPORT TRADE

In his article on page 529 of this issue Mr. V. J. Stock, a prominent electrical contractor, expresses some views on export trade and puts forward suggestions for increasing it. We cannot entirely endorse Mr. Stock's strictures upon electrical manufacturers generally; after all the industry is the country's second largest exporter. But we do agree that a greater proportion of its production could be sold overseas and that many firms do not want to be bothered with the complexities of export trade.

Mr. Stock advocates the setting up of an export market research organisation by the industry. There are possibilities in this but the infinite variety of electrical products almost compels individual, or at least sectional, investigation of markets. His other main proposal is a finance corporation to guarantee export credits. This would be very useful to smaller firms but the backing would have to come largely from the larger concerns, who are already best able to arrange credit. Possibly more elastic procedure on the part of the Export Credit Guarantee Department would be more effective—a possibility which Mr. Stock also mentions. However that may be, we hope that the article will stimulate thought and discussion and we would be glad to have readers' views.

HELP AND SELF-HELP

Members of the Electric Light Fittings Association, at their annual luncheon last week (see page 555), were offered the fullest assistance of the Board of Trade by Mr. F. J. Erroll, Minister of State. They were reminded, however, that this assistance could be only by way of information and introduction through the Board of Trade's intelligence service and overseas officers; the actual selling had to be done by the members themselves.

This is realised by the Association whose president, Mr. D. L. Tabraham, insisted that improved export trade depended very largely upon the right attitude of mind; they had to get " export in the blood," decide upon the best approach, and pay the fullest attention to design, production and marketing methods. To help members in these matters E.L.F.A. had set up an Export Committee. Mr. Tabraham said that they were particularly interested in European markets. If members could not compete in these markets they would find it difficult to meet European competition on their home ground.

STABLE MARKET FOR APPLIANCES

The return to full-time working by certain refrigerator manufacturers and the continued recovery recorded by the Board of Trade in the sales by durable consumer goods shops could mean that the worst of domestic appliance manufacturers' recent troubles are over. The extension of the hire-purchase repayment period with the deposit retained at 20 per cent is thought likely by the trade to have only a marginal influence on the sales of the larger electrical appliances. The introduction of new automatic washing machines and a prolonged period of good weather, which would help to clear stocks of refrigerators, could be more important. A decision is also needed to end the present equivocal situation regarding retail price maintenance.

Sales tend in any case to be depressed at this time of year by the public's optimism, however unjustified, that there will be reductions of purchase tax in the Budget. The manufacturers' main complaint has been against the use of credit purchase controls to adjust the rate of consumer spending for they regard stability, of whatever rate of credit control is decided upon, as the main factor influencing the development of both home and export markets. Repeated representations by the B.E.A.M.A. on this point have now drawn the reply from the President of the Board of Trade that he recognises the need for stability in the sales of consumer goods and he hopes that the Government have now established a reasonable set of credit rates which may be maintained for some time.

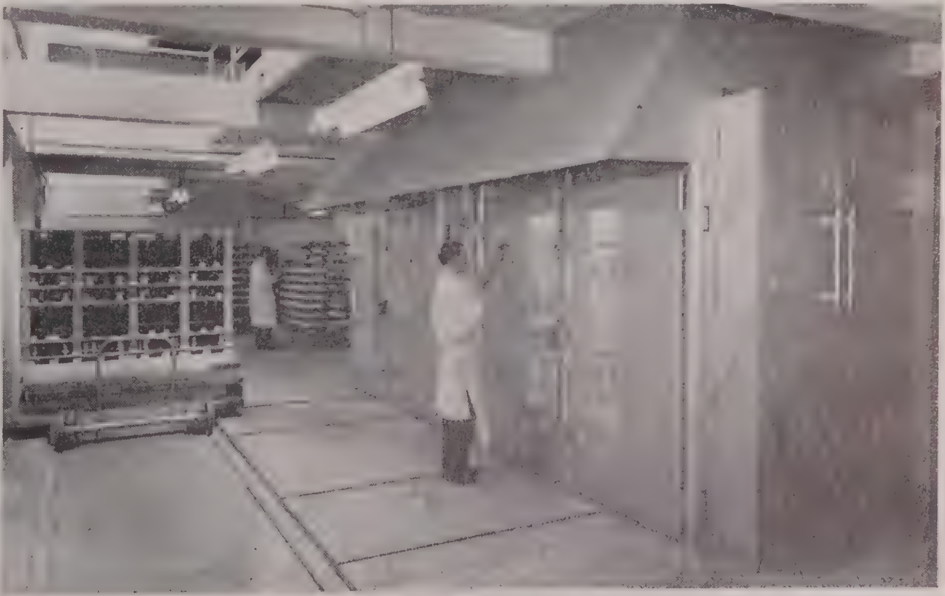
The origination of porcelain and the development of ceramic materials for electrical applications are described in this article contributed by the British Electro-Ceramic Manufacturers' Association. Details of the production techniques for the various materials are given

Electro-Ceramic Development

PORCELAIN originated in China and can be traced back to the sixth century A.D. It is a white substance of a hard non-porous nature and translucent, having a texture and appearance which made it an ideal medium for artistic pottery. Many centuries passed before Continental manufacturers succeeded in copying it, and the first known French porcelain of an artificial composition was made in 1693, later to be followed by a true porcelain in Germany. In England, felspathic porcelain never developed to any extent for domestic and artistic uses, but instead bone china came on to the market with quite different characteristics.

When, in the middle of the 19th century, electricity made rapid progress, it was not surprising to see that Continental manufacturers making domestic porcelain produced their first insulators out of the same materials. In England, since bone china does not have the characteristics essential for a good insulator, special firms started to manufacture porcelain for industrial use only. Porcelain proved to be an ideal material for electrical insulation since it has good mechanical strength, a smooth surface which prevents dirt from adhering, resists attack by exposure to atmosphere, and will stand up to high temperatures without being damaged by atmospheric temperature changes. Further, it will not track or carbonise when subjected to heat due to arcing or current leakage caused by a pollution film on the surface and it has a high volume resistivity. It can be manufactured into many shapes and sizes with reasonable dimensional accuracy. The main constituents are china clay and ball clay from

Above: Loading small components in readiness for firing in intermittent kilns



Right: The material is converted to porcelain at 1,200°C in furnaces such as these electric intermittent kilns

Dorset, Devon and Cornwall, and other materials such as quartz and felspar from the Scandinavian countries, and steatite. Analysis, blending and preparatory processes are all laboratory and process controlled and carried out to very fine limits in accordance with the different forming methods and ultimate function of the product.

Electrical accessories and fittings, such as lampholders, switch bases, cleats, connectors, fuse bases and carriers, etc., are mostly manufactured by the pressing method, either by the semi-dry or dry process. For semi-dry pressing the material is prepared in powder form with only sufficient moisture content to enable it to flow under comparatively low pressure, enabling less complicated steel dies to be used. After drying, the formed parts are fettled and glazed by hand-operated spray guns or automatic machines depending on their shape and quantity required, and are ready for firing which is usually carried out in continuous tunnel kilns up to 300ft long, or intermittent kilns. At a temperature of 1,200°C and above in an oxidising or neutral atmosphere the material is converted into a vitreous non-hygroscopic mass called porcelain. Firing of the semi-dry pressings causes a shrinkage of approximately 12½ per cent or more, and this can vary with size and shape. It is for this reason that special tolerances are normally specified, varying with the type of article in question. For dry pressing the material is prepared in powder form, but in the absence of moisture the flow is not so free, and the pressure must be three or four times greater than with the semi-dry process. More complex steel dies are used to control and minimise distortion. The dry pressing process is ideal for automatic production where large quantities are required.

High-voltage porcelain for insulators up to 400 kV and more is being used for a wide variety of purposes. The main items are strain and suspension insulators, transformer bushings, post insulators, pin insulators, cable sealings, etc. The material for this range is in plastic form which is first de-aerated under vacuum. The forming is then done, depending on the shape and quantity of insulators required, by either extruding, hot pressing or jollying in machines with revolving spindles carrying plaster-of-paris moulds in which the material is shaped by metal tools, or with a reduced moisture content by turning on vertical or horizontal profile machines or by hand turning. Shapes which are neither cylindrical nor tubular are often made by casting in plaster-of-paris moulds. After drying, the articles are glazed by dipping or spraying, and are ready for firing at 1,200°C or more. Conversion of the material into porcelain gives a reduction in linear dimensions which can vary according to the shape of the article and special tolerances are, therefore, applied. If fine limits are required the porcelains can be ground after firing.

Glazing is a highly developed process which can be controlled and adapted to suit special requirements. Most insulators have a clear or dark brown glaze. The shading of the latter varies considerably with the different manufacturers, and steps are being taken to reduce the differences. Semi-conducting glazes, i.e. those with a network of electrically conductive crystals, are finding an ever-increasing market. The resistance, which can be altered, depends on the composition of the oxides in the glaze, the thickness of coating and the firing schedule. It is possible to vary the surface resistivity over a wide range. The main use of this type of glaze is for the reduction or elimination of radio interference, as locally applied semi-conducting glazes increase the voltages at which discharges commence. Glazed insulators can be metallised with silver, platinum, nickel or other metals, and this enables soldered connections to be made. They

Above: Hot pressing high-voltage porcelain

Right: Building-up a high-voltage porcelain bushing undergo special firing at a lower temperature. Metal can also be applied to the unglazed part of the porcelain.

With the rapid development of electric heating, new materials had to be found. The main characteristic had to be a low coefficient of expansion, and a vast range of electrical refractory ceramics has been developed. The main requirements are the ability to stand up to high temperatures, to withstand rapid temperature changes, to maintain good electrical insulating properties at high temperatures, and to have adequate mechanical strength. This type of insulator is mostly used for electric fires, furnaces, arcing chambers, etc. They are mainly manufactured by the pressing or extrusion method, and the firing is similar to that for electrical porcelain.

It became necessary to develop special materials which would have very high mechanical strength coupled with high heat and wear resistance. In this range the most successful are the high alumina ceramics. These consist of a very high percentage of alumina (aluminium trioxide or corundum), and the electrical properties, thermal conductivity and mechanical strength improve in proportion to the quantity of alumina present. The firing temperature can be as high as 1,800°C and to obtain complete vitrification at lower temperatures fluxing agents are added. It is also essential to incorporate plasticisers to make the material workable. The shaping of the insulators is mostly done by the dry-pressing process and by extruding. Due to the very high abrasive properties of these materials, the wear on the dies is extremely heavy and they are often made of sintered tungsten carbide. High alumina ceramics can be glazed in the same way as electrical porcelain, and this ensures an excellent electrical surface resistance. The firing shrinkage amounts to 16 per cent and upwards, and the normal dimensional tolerances are similar to electrical porcelain. Fine limits can be achieved by grinding, but due to the extreme hardness after firing, silicon carbide wheels show very rapid wear and tear and diamond wheels are mostly used. Metallising is also applicable, and copper and nickel are mainly used. Titania (titanium oxide) materials are used where extreme hardness is required. If glazed, these types of insulators can be metallised with tin or other metals, and this facilitates soldering. A special firing process at a lower temperature is necessary.

The requirements of the electronics industry have created another rapidly-developing range of materials known as ferro-electric ceramics for highly specialised uses such as capacitors, cores for electronic computers, waveguides for radar and v.h.f. radio, etc. These ceramics do not generally contain iron, but their properties can be regarded as the electrical analogue of the magnetic properties of iron. To be ferro-electric, the material must be inherently polarisable, and the direction of its polarisation must be controllable by a relatively weak applied electric field. Many different materials are being used: so far the main constituent is barium titanate. They are normally fabricated in simple shapes by dry pressing or by extruding, and are fired at temperatures in the range of 1,200/1,400°C. In the form of thin pressed discs and thin-walled tubes they provide a range of capacitors which now rival in importance mica and paper dielectric capacitors.

E.R.A. REPORTS

THE no-load losses of an induction motor are composed of core loss, friction and windage losses, and copper losses in the stator/rotor windings which are relatively small. It is found in practice that the no-load losses in certain types of machines are considerably higher than their calculated values. Since the friction, windage and copper losses at no-load can be accurately predetermined and are found to vary only very slightly for machines of the same type, the considerable additional no-load loss must be the result of an excess loss in the core of the machine, which may be as high as two to three times that anticipated. The same phenomenon applies to both a.c. and d.c. machines of various sizes.

The excess in core loss not only presents difficulty to motor designers in estimating the temperature rise of any new line of induction motors, but is found to produce hot spots at various places in the cores of motors whose working life may thus be greatly shortened. An Electrical Research Association report, Ref. Z/T120 "Stray Losses in Laminated Cores with Particular Reference to F.H.P. Motors. A Résumé of Published Information," by W. S. Leung (price 10s 6d), presents a summarised study of past publications on or connected with the above subject with a view to a fuller investigation of stray eddy-current losses in laminated machine cores.

Report Ref. Z/T130, "An Investigation on Stray Eddy-current Losses with Particular Reference to F.H.P. Induction Motors (Concluded). II. The Dynamometer Core-Loss Tester," by D. A. Jones and W. S. Leung (price 10s 6d), deals with an investigation to find the order of magnitude of the stray loss in f.h.p. induction motors and compare the results with those obtained with rectangular core specimens as described in report Ref. Z/T123. Stray eddy-current losses of specimens from a certain design of a f.h.p. induction motor stator were obtained experimentally using a dynamometer core-loss tester. The construction of the dynamometer tester and core-loss measurement technique are described. Stray eddy-current losses due to machining, grinding, welding, filing, and riveting have been investigated.

Copies of these reports are available at the prices indicated from the Publication Sales Department of the Association at Cleeve Road, Leatherhead, Surrey.

NUCLEAR ENGINEERING COURSES

A ONE-YEAR full-time post-graduate course in Nuclear Technology for the 1961-62 session will be held at Imperial College, London. The fee for the course is £64 and applications should be made before 1st June on a form obtainable from the Registrar.

Ten lectures on "Reactor Fuel Element Technology" will be given at Imperial College on 4th, 11th and 18th May, 1961. The fee for this course is five guineas but post-graduate students of the college and inter-collegiate students may be admitted free.

Further details can be obtained from the Registrar, Imperial College of Science and Technology, London, S.W.7.

The President of the Board of Trade, Mr. Reginald Maudling, at the B.E.A.M.A. Council's annual luncheon with (left to right) Mr. Anthony M. Browne (the new president), Mr. Kenneth Allen (the retiring chairman) and Mr. Stanley F. Steward (director)

B.E.A.M.A. CHANGES APPROVED

New President and Deputy President Elected

CHANGES in the constitution of the British Electrical and Allied Manufacturers' Association were approved at an extraordinary general meeting on 15th March which followed the annual general meeting. The offices of president and chairman are now combined under the title of president, and the president will take the chair at the meetings of the Council. A new office of deputy president has also been created.

The position of vice-president is abolished but the Council will have the power to elect to a new office of " counsellor " past-presidents and past-chairmen of the Association who are either directors or full-time executives of member-firms. In this way the Council will secure the guidance of senior members of the industry who do not wish to continue to be their firm's representatives on the Council.

At a subsequent meeting of the Council, Mr. Anthony M. Browne, B.Sc., A.R.C.Sc.I., was elected to the new office of president and Mr. H. H. Mullens, B.Sc., M.I.E.E., was elected deputy president.

Mr. Browne is chairman and managing director of the Hackbridge & Hewittic Electric Co., Ltd., and chairman of Combined Electrical Manufacturers, Ltd. He has been a member of the B.E.A.M.A. Council since 1954 and is a member of the B.E.A.M.A. Export Panel and of the recently formed Export Council of Europe.

Mr. Mullens is chairman and managing director of A. Reyrolle & Co., Ltd., and chairman of C. A. Parsons & Co., Ltd. He was chairman of the North Eastern Electricity Board from 1948 to 1954 and an *ex officio* member of the British Electricity Authority from 1952 to 1953.

Stable Home Market Needed

At the Council's annual luncheon on 15th March, Mr. Kenneth Allen, the retiring chairman, said that only a stable Government policy could ensure continued success in the export markets for British electrical goods.

Manufacturers must be able to plan ahead with confidence and to design for high volume, efficient production. This required a substantial, continuing home market. Though the industry's exports were increasing, the rate of growth was by no means fast enough. Western Germany was now the world's second largest electrical exporter and threatened to overhaul the United States for first place.

The electrical industry's exports now accounted for 10 per cent of Britain's total exports of manufactured goods. In 1960 these shipments reached a record figure of more than £293 million—an increase of £8 million on 1959 and £17 million on 1958.

To maintain this growth and vigour, and to keep one step ahead of international competitors, required large-scale investment in research and development. This vital but expensive work must be supported by large-scale production in order to keep down the price of equipment in highly competitive world markets.

" Far from any complacency in the industry, there is tremendous enthusiasm for greater penetration into markets which offer a great potential, provided the means can be found of developing these economically," Mr. Allen said. " I am sure the Government recognises that we cannot run our business at a loss, but a stable home market can help to make our prices competitive."

More Exports the Answer

In reply, Mr. Reginald Maudling, President of the Board of Trade, said that the best way to avoid fluctuations in the home market was " to have the cushion of a bigger export trade." The need for exports, he added, was both political and economic. The home market depended on exports.

Mr. Maudling said he was heartened by the B.E.A.M.A.'s efforts to stimulate exports. He was certain the industry could produce and sell all that was necessary in the way of exports provided they went about it in the right way. He sensed a changing climate in British industry's attitude towards exports.

VIEWS on the NEWS

By "REFLECTOR"

RECENTLY it has been said that to place grid lines underground would cost seventeen times as much as running them overhead. This manifestly renders "undergrounding" impossible. The difference is, of course, much less in the case of low-voltage lines, although even here it is by no means negligible. There are places in which distribution systems really offend the eye and where some extra expense is justified. Inevitably, the Electricity Boards will ask who should meet the extra cost, for they are naturally unwilling to raise their charges to their consumers. The East Midlands Board has just agreed to bury the distribution lines in the village of Cranford, Northamptonshire, and to meet the whole of the cost. This has naturally brought the Board much goodwill, but it will probably also cause other picturesque villages to expect similar treatment. To satisfy any widespread demand of this kind would prove far too costly for the Board (or its consumers) and the civic authorities would have to be prepared to help financially.

* * *

It was appropriate that the Electric Light Fittings Association should hold its annual luncheon in the handsome hall of its forerunner in the lighting industry, the Tallow Chandlers' Company. Mr. P. Newnham, Master of the Company, mentioned in a speech that the tallow chandlers had had their problems—particularly the advent of gas lighting, which they had strongly opposed. Mr. J. G. Christopher had previously asked whether in the past the tallow chandlers had come up against such problems as the constantly changing value of candle power or the overheating of candlesticks.

* * *

Following upon the sentences of fines and imprisonment upon certain American electrical companies for infringements of the anti-trust law of the United States, the *Electrical World* (New York) reports various steps that are being taken by the companies to meet the possible consequences and avoid future trouble. The companies have to prepare for claims for heavy damages from customers who claim to have been overcharged. In the case of private (non-Governmental) customers awards of up to three times the amount of the excess charge can be claimed. Many public utilities are contemplating suits for recovery of damages. Three of the largest companies have stated that they will make voluntary studies with consumers of possible claims although they contend that their profits in these cases were not excessively increased by the higher charges. The Westinghouse Electric & Manufacturing Co. is setting up a new "anti-trust section" to ensure that there are no future transgressions of the kind which brought it up against the law.

One case against the American General Electric has already been dismissed. This is not surprising: a couple of people, acting, they claimed, for themselves and 50 million other G.E. customers, brought a claim for $750 million. The New York correspondent of the *Financial Times* says that the judge held that the claimants had not shown that they truly represented the other 50 million.

* * *

It is reported by the *Evening Mail*, Dublin, that the County Sligo Vocational Education Committee has decided to have no electrical appliances, particularly cookers, installed in its new schools until the Electricity Supply Board gives an assurance that there will be no further increases in its charges. This is the sort of assurance that all consumers (not only Irish ones) would be glad to have. The chairman of the Committee said that it was only right that their pupils should be taught to cook on ordinary fires and not on electric cookers. And to do their ironing with flat-irons by candlelight ?

* * *

A Bolton household has been disturbed by queer happenings. A local newspaper says:—

> "The electricity meter at the house has been blown up twice. Even after the electricity has been cut off wiring in the house has set on fire. Holes have appeared mysteriously in water and gas pipes and strange noises are being heard in the night."

The occupants attribute all this to ghosts, but the more mundane Electricity Board thinks that some human agency has been at work and has put in a £25 bill for repairs.

* * *

The values of electrical units were still an unsettled subject seventy years ago as the following quotation from the *Electrical Review* of 27th March, 1891, suggests:—

> "A correspondent has sent us a cutting from a paper circulating in the Lakes district which devotes a portion of its space to describing the electric launches which are to ply on Windermere. We notice that the *ampères and all electrical fittings* are Immisch's patents, and really, pending the final solution of the electrical units difficulty, we see no reason why everybody should not use his own particular patent ampère."

Engineering Aspects of PLASMA PHYSICS

By R. CARRUTHERS, B.Sc.(Eng.), A.M.I.E.E.*

Summary of a lecture given before the Electronics and Supply Sections of the Institution of Electrical Engineers last Wednesday by R. Carruthers and D. L. Smart, B.Sc.Tech.

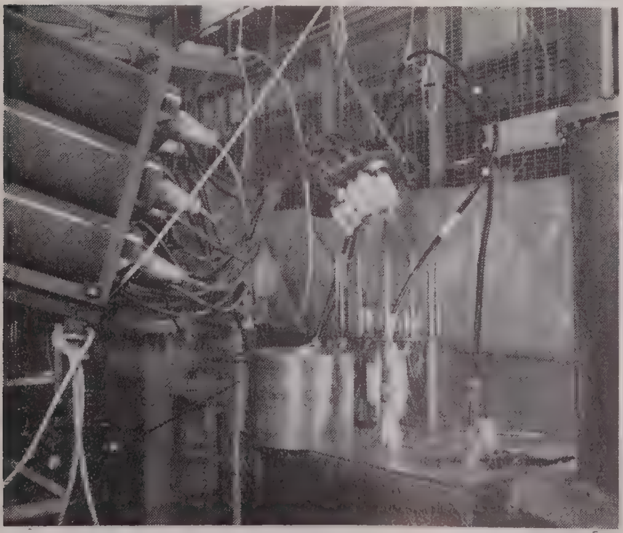
ONE aspect of plasma physics which has received increasing attention over the last decade is the study of methods of heating and containing very hot plasmas of the " heavy " hydrogen isotopes, deuterium and tritium, with the ultimate aim of producing power from controlled thermonuclear reactions (C.T.R.). Successful release of fusion power will require the heating of dense plasmas to temperatures of 10^7 to 10^8°K, and its stable containment by strong magnetic fields, and present experiments are largely directed towards the various possible methods of solving one or other of these twin problems of heating and stable containment.

At Livermore (U.S.A.) the " Toy Top " multi-stage compression mirror experiment uses energy from capacitors to compress plasmas adiabatically in a magnetic field, and temperatures of 35×10^6°K have been achieved, with containment for 1 millisec. The DCX-2 experiment (Oak Ridge, U.S.A.) requires large d.c. supplies, 10 MW for the magnet and a 1 A, 600 kV supply for the injection of ions having high initial energy. The new C-Stellarator (Princeton, U.S.A.) is a large experimental facility, aimed at experiments on the heating of plasma stably contained in a " closed loop " magnetic field system. This system will have a pulsed supply from flywheel m.g. sets of 200 MW peak. A medium-sized experiment at the Atomic Energy Establishment, Harwell, is designed to explore plasma containment in fields with " cusped geometry." Experiments aimed at shock heating by very fast movement of plasma include the " Maggi II " capacitor bank at the Atomic Weapons Research Establishment, Aldermaston, and a small ultra-fast pinch experiment at the A.E.R.E., Harwell, in which the current approaches its peak value in 5×10^{-9} sec.

Much of the engineering work is associated with problems of energy storage in capacitor banks and the switching and transfer of this energy into the magnetic fields in the experiment. The testing rig shown in the illustration is typical of the component development work required for medium-sized experiments. Twelve 1 μF, 40 kV capacitors are connected by low-inductance coaxial cables to the upper electrode of a spark-gap switch, shown dismantled for examination. The output cables are connected from the lower electrode to the large coaxial inductor just visible on the right, which acts as a test load. In service on the experiment up to 20 capacitor/spark-gap units will be connected in parallel, giving currents rising to a peak of 2½ million A in about 5 μsec.

The physics scaling factors are such that future experiments may well require the switching of several megajoules of energy, and switching systems will be needed which will safely handle up to 10^6 MW—but only for a few microseconds. Systems of this size will require the development of capacitors, spark-gap switches, cables, and insulation techniques for reliable operation at up to 100 kV. A factor which will ease some of the problems is that experiments are only required to have a life of some 10^5-10^6 pulses, and considerable economies in insulation thickness or arrangement are possible by departing from normal power engineering practice.

Another major factor in the engineering of C.T.R. experiments concerns the wall material for the containing vessel. This must not be seriously damaged by accidental contact with the plasma, and during normal operation it must give off the minimum of materials or occluded gases, which would contaminate the plasma and cause excessive energy loss by radiation. These requirements may in themselves dictate the size of the vessel, and thus determine the physics parameters of the experiment, so as to reduce the energy density reaching the walls to tolerable values. Work has been done on the effects of plasma in causing arcing on conducting walls, or thermal damage on insulating surfaces; and methods of making large porcelain toroids with up to 1 metre bore diameter have been investigated experimentally.



Development rig for a 40 kV, 120 kA spark-gap switch

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* United Kingdom Atomic Energy Authority, Harwell.

Nuclear Power in Spain

The *Fortnightly Review* of the Bank of London and South America reports that Centrales Nucleares del Norte has applied for authorisation to establish a nuclear power plant at Valle de Tobalina in the Province of Burgos. The plant, which will be known as Bilbao-Ebro, will have a capacity of 250 MW.

ELECTRIC FLOOR WARMING SYSTEMS

General Installation Recommendations

THE steady increase in popularity of electric floor heating has caused the Electrical Floor Warming Association to prepare some general recommendations concerning the installation of directly embedded electric floor warming systems. These, which are reproduced below, cover practically every aspect of such an installation, ranging from the site conditions and perimeter insulation through installing the cables to laying and drying out the floor screed. These recommendations are to be issued by the Association as Information Bulletin Ref. A/61.

Structural Factors

1. *Co-operation between the Trades.*—In the course of installation an electric floor warming system becomes an integral part of the building structure, thus making demands upon both the building and electrical contractors. It is highly important, therefore, that there should be close liaison between the two trades at all stages of the work.

2. *Perimeter Insulation.*—For maximum efficiency of the heating system it is most desirable to insulate the floor slab. Expanded polystyrene, cork, expanded rubber, or rigid fibreglass are good materials for this perimeter (or "edge") insulation. In ground floors this should extend vertically from screed level to the underside of the floor slab, and horizontally for 3ft under the slab. Alternatively, if the amount of material required is less, the vertical layer of insulation can be extended down to the footings. In considering other insulating materials preference should be given to those which for all practical purposes are non-hygroscopic.

3. *Check the Site Conditions.*—In the case of sites known to be in an area with a high water table, a damp-proof membrane as well as thermal insulation should be incorporated in the floor construction. This would then comprise floor finish, screed, floor slab, insulation, damp-proof membrane, blinding and hardcore. Where definite information on site conditions cannot be obtained, it is always wise to incorporate a damp-proof membrane.

4. *Effect of Fitted Carpets.*—Where it is known that there are to be fitted carpets and underfelts, it is advisable to extend the horizontal portion of edge insulation under the whole of the ground floor slab. In the case of carpeted suspended floors, thermal insulation can be applied to the soffit of the floors, special attention being given in this respect to the top floor in multi-storey buildings.

5. *Fixtures and Fittings on a Heated Floor.*—It is recommended that heating cables should not be laid under floor-standing fittings and fixtures unless there is a minimum clearance of 3in between the floor finish and the underside of the fitting.

Installing the Cables

6. *Know the System.*—Before commencing any installation work it is essential that the electrician be thoroughly familiar with the type of cable and the installation method. Where it is to be made to a drawing or schedule a check should be made on site of the cable lengths and areas involved, since any late amendments to the building plan can cause a considerable amount of trouble if not discovered before work is commenced. Installation notes supplied by the manufacturer should be studied and adhered to, and should the electrician have any doubt as to the correct procedure the advice of the manufacturer or designer should be sought.

> The Electrical Floor Warming Association was formed in December, 1958, to provide a forum for the exchange of technique and experience, with the object of furthering the application of floor warming systems and improving their performance. The Association is composed of the following members:—Aerialite, Ltd., B.I.C.C., Ltd. (Panelec Heating Division), Calidec, Ltd., Pyrotenax, Ltd., Simplex Electric Co., Ltd., Thermodare (Gt. Britain), Tyrad Electric, Ltd., Volex Electrical Products, Ltd., and Wandleside Cable Works, Ltd.

7. *Procedure.*—The first step consists in placing the spacer bars or fixing discs at the extremities of the cable run. The design of spacer or fixing recommended by the manufacturer should be used and the makeshift use of nails or spigots leading to sharp bends in the cable is deprecated. The cable is then laid between the spacers with sufficient tension to maintain spacing throughout the run, but capable intermediately of taking up the configuration of the floor slab under the weight of screed. Care must be taken to avoid tensioning the joints made between the heating cable and the cold tails.

8. *Keep to Cable Lengths.*—Heating cables must not be shortened without reference to the designer or manufacturer of the system.

9. *Cables Laid Direct on a Damp-proof Membrane.*—Where a decision to use floor warming has been made after the floor slab has been laid, a damp-proof membrane can be applied between the floor slab and screed. Although there are certain materials which are claimed to withstand the considerable amount of heat from the cables without adverse effect, the advice of the cable and membrane manufacturers should be sought.

10. *Acoustic Insulation.*—Occasionally a compressible fibre quilt or similar form of insulation is included in the floor construction for acoustic purposes. Plastic or rubber insulated heating cables must never, however, be laid in direct contact with insulation of this kind, but should be separated from it by a layer of screed. The edges of flexible quilting must not be doubled back over the cables at the sides of the room. Any chicken wire, expanded metal or other form of screed reinforcement must not touch the cables.

11. *Continuous Monitoring.*—Experience has shown that periodic testing of the heating cables up to the stage

where screeding has been completed does not overcome the possibility of the installation containing a faulty cable. Suitable monitors are available by which a continuous check can be carried out. Where metal-sheathed mineral insulated cables are being used a "Megger" insulation resistance tester used frequently during installation is sufficient.

12. *Prepared to Repair.*—It is advisable to have a cable repair kit available on site when cables are being installed.

Applying the Floor Screed

13. *The Right Screed.*—The screed should be as dry as possible, free from sharp-edged aggregate and well compacted to avoid air spaces round the cables. Generally a screed mix of 1 : 3 cement to sand is suitable, but the architect or building contractors should be consulted. Lightweight or cellular screeds should not be used.

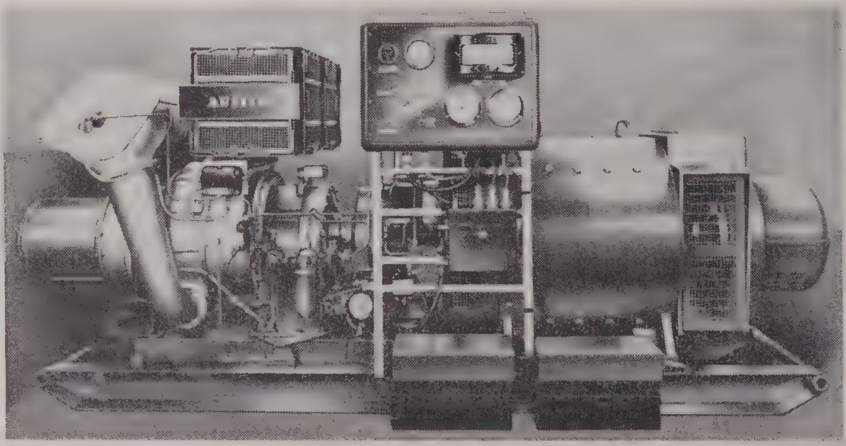
14. *Placing the Screed.*—The sequence of operations should be such that screeding takes place immediately after laying the cables, but if for any reason this cannot be done, effective steps should be taken to ensure that the cables are left undisturbed and protected against any possible damage being caused by building operations carried out in the vicinity. Failures have occurred due to damage from heavy or sharp objects or other forms of maltreatment, and therefore the question of protection at this stage cannot be too highly stressed.

15. *Precautions During Screeding.* — Precautions should be taken against disturbing the position and spacing of cable runs, by spreading the screed in a direction parallel to the cable. Operatives should wear rubber-soled boots, and avoid damaging the cable with screed-spreading tools. Wheelbarrow runways should be provided and the screed tipped on either side of the runway at intervals to keep the cables at the correct spacing.

When the Installation is Complete

16. *Drying Out the Screed.*—The screed should be allowed to dry out thoroughly before any heating is switched on. If there is a damp-proof membrane immediately below the screed or there is a suspended floor the minimum drying-out period is two weeks, but for a ground floor slab with the damp-proof membrane below the slab the minimum drying period is four weeks. During the first two weeks after switch-on the intake hours should be progressively increased by one hour per day up to the full tariff hours. No impervious floor finish should be applied until full heat has been on for at least two weeks.

INDUSTRIAL GAS TURBINE



Austin 250 b.h.p. gas turbine coupled to a 200 kVA alternator

THE driving of "mains failure" generating sets will be one of the principal applications of the new Austin 250 b.h.p. industrial gas turbine developed by the British Motor Corporation and introduced this week at the A.S.E.E. exhibition. The turbine is a single-shaft machine in which the turbine rotor drives a centrifugal compressor at 29,000 r.p.m. to give a pressure ratio of 3·5 : 1. Power is taken through the rotor assembly through a two-step layshaft reduction gear using double-helical gears. The output speed is reduced to 1,500 r.p.m. for 50 c/s generation. Starting is automatic and pushbutton initiated and the unit can be on full load in 50 sec from cold. Initially, it will be available coupled either to a 200 kVA alternator, or to a centrifugal water pump delivering 2,500 gal/min, at 100 p.s.i. with a suction lift of 10ft, or as a separate unit. In its basic form it measures 37in long by 35in wide and 51in high and costs about £2,500 without silencers. The specific fuel consumption is 1·1 lb/b.h.p.-hr at full power although heat exchangers are being developed which will reduce this figure to 0·55 lb/b.h.p.-hr.

The fuel system and combustion chamber are supplied by Joseph Lucas, Ltd. On starting, the unit is driven up to light-up speed by a 24 V d.c. motor mounted on the gearbox driving through a sprag clutch; admission of fuel, ignition, switching off the starter, and control of acceleration are effected by relays and solenoids. The instrument panel carries a tachometer, maximum gas temperature indicator, fuel and lubricating oil pressure gauges, engine hours meter, and the starting button. Automatic devices protect the unit against over-speed, excessive gas temperature or bearing temperature, or loss of lubricating oil pressure. The 50 gal fuel tank, incorporated in complete generating or pumping sets, permits 1½ hours' full-load running on one filling.

Domestic Supplement — Vacuum Cleaners and Floor Polishers — at the end of this issue

"EXPORT TO EXIST"

By V. J. STOCK*

WHAT MANUFACTURERS OUGHT TO CONSIDER

After some severe comments on the attitude of electrical manufacturers towards export trade, the author puts forward suggestions for a combined effort, including the means of providing long-term credit where this is necessary

IT has always struck me as extraordinary the way leaders of free enterprise call on the Government to solve their problems when they get into difficulties, and it was such a demand made from the platform at the last British Electrical Power Convention after the paper on exports which first made me realise this fact.

When, in October last, a meeting was called to decide whether the industry needed a forum at which the various sections could meet and discuss common problems, I thought that this was an opportunity which would be seized upon by all those present to organise collaboration and co-ordination inside this vast industry, but I was wrong. The meeting fizzled out like a damp squib because those who should have led could see nothing wrong with things as they were, and in fact obviously held the view that the industry was in fine shape.

I wonder whether things are really as good as they seem to be. Twelve months ago the motor car industry was booming and the future seemed to be aglow with prospects of permanent prosperity. What of today when thousands are on short time and cars are piling up in thousands in the stockyards? It would seem from this that our prosperity of today rests on borrowing from the future if, as the car industry asserts, its present troubles are due to the restrictions on hire-purchase, and it is interesting to note again that this vast section of private enterprise has called on the Government to solve its problems for it.

I would invite all those engaged in directing the electrical industry to think very carefully about the car industry, because what has happened there can happen to us, and indeed we may find this kind of situation being reached rather rapidly as the purchasing power of all those directly and indirectly connected with the car industry diminishes below the point where washing machines and refrigerators are a necessary luxury. It would be well for them to realise that the electrical industry is far more vulnerable than the car industry because the latter has always been organised to create a demand in the export market, whereas our industry has rigidly adhered to a plan of production based on home trade. This is proved by the figures for electrical exports which amount to approximately £250 million against a total production figure for the industry of around £1,400 million.

In my opinion home sales and exports cannot be treated as separate entities because they both represent factory production, and the only hope of a stable industry is in the long-term planning of a sensible balance of the two outlets.

It is evident that the industry has done little to encourage exports, let alone attempt to balance them with home production. The truth is that the majority of firms are interested in exports only if inquiries happen to come their way, and because of this they have neither the knowledge nor staff to properly deal with a subject which requires both skill and experience. One result of this is that the types of inquiries which come in this accidental fashion are received by a number of firms who compete enthusiastically with one another until one firm obtains the order and burns its fingers, and then the cry goes up that there is no profit to be made in exports.

Need for Co-ordinated Export Drive

The plain fact is that the industry has never attempted to act collectively, and has so lacked leadership that some well-known firms, more patriotic than the rest, have been prepared to co-operate in the offer made by a national newspaper, more famous for its appeal to the gentler sex than its industrial record, to co-ordinate their efforts in an export drive. Laudable though this effort may be, it cannot do more than scratch the surface of the problem. It certainly cannot organise an industry which appears unable and unwilling to co-operate within itself for its own future welfare.

Whilst I do not pretend to know all the facts, I have sufficient knowledge of what is going on in the export side of the industry to be able to state definitely that there is little will to export in most firms, large or small, and it is clear to me that there never will be until a co-ordinating organisation is brought into existence with sufficient financial backing to be able to bring the whole industry into touch with overseas markets, and to provide research on a grand scale to enable the producer to know what he has to produce and at what price. The type of research necessary to enable a real attack to be made on the export markets throughout the world could never be carried out by one firm, however large, but co-operation throughout the industry could provide the finance without any undue burden being placed on anyone.

Not only should the industry combine for the purpose I have already suggested, but it should also bring into being a finance corporation owned and financed by the industry for the purpose of providing long-term credits for capital goods, and subsidies to enable consumer goods to be sold at below cost where necessary to keep or capture a market that would otherwise be lost to our foreign competitors. This finance could be obtained by a levy on the home market where, particularly at the present time, the effect would be hardly noticed provided the scheme was adopted by a large majority. For instance, a 5 per cent levy would provide approximately £50 million per annum, according to such information as I have been able to obtain, and I believe it would be possible to double this figure if necessary without materially affecting home demand.

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* Mr. Stock is a director of the Berkeley Electrical Engineering Co., Ltd., and a past-president of the Electrical Contractors' Association.

Even if there was some effect on home sales, I believe it would be worth while, because the ultimate increase in exports would more than compensate the manufacturers. In any case I do not think anyone could argue that a £40 washing machine increased to £42 would cease to be sold on the home market because of the price increase, especially if prices of all well-known makes were lifted in exactly the same proportion. There could be even less argument in the case of all installation materials because at the present time, owing to recent heavy wage increases, there is a dangerous out-of-balance in the relation of wages and materials in construction and installation work, which would be helped considerably by an increase in the cost of materials over and above that made necessary by rising production costs.

Long-Term Credits

I believe that the proposals I have made, coupled with a concerted effort by a large number of firms inside the industry, could be used to the benefit of manufacturers of both consumer and capital goods alike, and in fact I envisage the possibility of influencing markets for consumer goods by the offer of long-term credits for capital goods. It might be said that the amount of capital available from a levy such as I have suggested would be too small to have much effect on world markets, which might be true if this were the only source of credit, but I believe greater help might be forthcoming from the Export Credits Guarantee Department for individual projects if the industry was also prepared to give financial support.

The apathy towards exports throughout the industry exists because manufacturers are unable to consider exports in their production planning on account of their sporadic nature, but if they were able to regard export trade in the same light as home consumption, then a great many of the present troubles would disappear. Those of us who place export orders are appalled at the apathetic attitude of the manufacturers, almost all of whom do not seem to care whether the goods are dispatched months after the promised time, and most of whom seem to know little about the mechanics of the export business.

I am convinced that exporting can be as profitable and as stable as the home market, and a planned combination of the two could not only ensure full output from our factories, but it could also lead to large-scale expansion throughout the industry, with ultimately lower prices both home and abroad; and what is more important still, a situation such as exists at the present time in the car industry could be avoided.

At the moment, in the home trade, there are indications of a recession in the field of consumer goods because of the growing amount of short-time working in many of our major industries, and it seems to me to be a suitable time to send our goods abroad instead of trying to force retailers to carry stocks they can never sell.

The advantages to be gained by an industry-wide organisation for the expansion of exports are immense, and I believe such an effort would receive the full support of the Government.

In these brief notes it is impossible to give more than an outline of my ideas, but I would appeal to the industry to once more call its leaders together to at least find out whether they are interested in exploring them further, so that the theme of the British Electrical Power Convention last year, at which these ideas were first born, could be realised in the export field and so create a new horizon clear of the clouds of ignorance and apathy which have so far prevented us from taking our proper place in the markets of the world.

Letter to the Editor

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Status of Engineers

I SHOULD like to refer to Mr. J. W. Thomas's letter published in your issue of 24th February. This raises the question whether it is either appropriate or desirable that professional engineers should be represented by a trade union.

I believe that Mr. Thomas is correct in supposing that there is no indication that the Engineers' Guild is prepared to do anything effective about this problem, and that it is at present definitely not prepared to undertake anything of the nature of collective negotiation. If, however, a sufficient number of professional engineers, who would like to see a change of policy in this connection on the part of the Guild, should become members, presumably they could influence the Guild Council. They are unlikely to achieve this by remaining outside.

West Kirby, Cheshire. L. J. ARCHER,
B.SC., A.R.C.SC.I., A.M.I.E.E.

ELECTRONICS STANDARDS

AN interlocking system of technical standardisation in the electronics industry is to be set up throughout Europe. A statement issued on behalf of the United Kingdom electronics industry says: "As a result of a recent meeting of Western European national standards organisations it has been agreed that the 13 countries in the Free Trade Association and the European Economic Community should collaborate on an equal footing, with a view to producing common Western European standards. It is proposed that this end should be achieved by developing and promoting the use of internationally agreed characteristics and performance standards from such bodies as I.S.O., I.E.C., C.C.I.T.T., C.C.I.R. and C.E.E."

INDUSTRIAL NEWS

Semiconductor Applications Laboratory

AN applications laboratory for proving the design and serviceability of silicon semiconductor devices has recently been completed by Ferranti, Ltd., at their Gem Mill factory at Oldham, Lancs. Since its formation at the company's Moston factory in 1957, the laboratory has accumulated information on the behaviour of the range of silicon semiconductor devices produced by the company under almost all possible operating conditions. Particular attention is paid to surge testing, a special equipment having been built for this purpose. In most instances surges up to 200 times the normal current rating are applied to devices for varying periods of time.

Typical of the work now being carried out is the construction of a scale model of a 110 kV, 2 A supply, for investigating problems associated with connecting large numbers of silicon rectifiers in series. These include unequal reverse impedances, unequal hole storage characteristics arising from the rapid rise times associated with the circuitry, and the problems surrounding the physical layout of the completed equipment which will accommodate about 2,000 rectifiers. A considerable amount of experimental work is also carried out on the design of rectifier stack assemblies with the object of making them lighter and stronger. Hole storage characteristics and decay times of devices are being continuously investigated.

Ferranti applications laboratory for silicon semiconductor

Next Year's Power Convention

The 1962 British Electrical Power Convention will be held at Brighton from 4th to 7th June. The president-elect is Sir William McFadzean, C.A., Companion I.E.E., chairman of the British Insulated Callender's Cables group of companies

NESTOR CRITICAL

The new 10 kW reactor, NESTOR (Neutron Source Thermal Reactor), was put into operation for the first time at the Atomic Energy Establishment, Winfrith, on 13th March. Its purpose is to act as a source of neutrons for sub-critical assemblies of nuclear fuels and moderators. The reactor core, control gear and instrumentation was designed and installed by the Hawker Siddeley Nuclear Power Co., who modified the design of their Jason reactor to enable up to five sub-critical assemblies to be driven simultaneously by the reactor. The Turriff Construction Corporation, Ltd., was responsible for the installation of the special shielding and the civil work generally.

New Storage Heater

FOR some time the Eastern Electricity Board and its heating engineer, Mr. Leslie Shepherd, have been developing an electric storage space heater which is particularly suitable for use in village halls, night schools and other places where the demand for heat is intermittent or irregular. The heater, for which the Board and Mr. Shepherd hold a joint patent, uses off-peak electricity and stores the heat in heavily insulated blocks. A thermostatically controlled fan fitted in the base of the unit blows air through inverted "U" shaped ducts in or surrounding the heating blocks, the air being discharged from the bottom of the case. The insulation and the shape of the ducts prevent the hot air escaping until it is needed and the fan is switched on.

Experimental models of the new heater have been in use at Eastern Electricity's Milton Road garage at Stowmarket and have proved very effective. Further development work is being done by a working party set up by the Electricity Council of which Mr. Shepherd is the chairman. An approach has been made to Eastern Electricity by a number of manufacturers of electric heaters asking for licences under which the new heater could be made in this country. These the Board is willing to grant since it is thought that the interests of the public will be best served if the new heaters are manufactured by a number of firms and not by one alone.

Support for North of Scotland Board

Inverness County Council on 9th March, with only one dissentient, affirmed its confidence in the North of Scotland Hydro-Electric Board and deplored any move to merge it with the South of Scotland Board.

GLASGOW RAILWAY TESTS

A train fitted with recording apparatus and modified to eliminate the suspected source of the mishaps which led to closure of the Glasgow suburban electric system after only six weeks' operation began tests on Tuesday night. Other modified trains will begin arriving later in the week, until all 67 trains withdrawn are received from the manufacturers.

A British Railways spokesman said the trains would be tested over the route, from Airdrie (Lanarkshire) to Helensburgh (Dunbartonshire), to "prove the equipment." It was not possible to say when passenger services would be reintroduced, but every effort was being made to do so as early as possible.

The House of the Future

THE kitchen of the future will be smaller with more built-in labour-saving equipment, said Mr. R. F. Richardson, chief commercial officer of the South Western Electricity Board, when he addressed the Electrical Association for Women on 17th March.

Mr. Richardson forecast that electrical appliances would be more compact and better looking. In the kitchen, electric cookers would have auto-controlled heating plates to keep food in a saucepan at the required temperature and a roastmeter (or thermostatic probe) would be used to predetermine just how the joints should be cooked. An electronic cooker had been developed that could bake a cake in six minutes but "as this cooker costs about £500 it cannot yet be said to be a commercial proposition." Refrigerators were being installed at the rate of a million a year in this country. Future models would be smaller. A new cooling principle was being developed to make refrigerators completely silent.

Single tub washing machines that automatically washed, rinsed and damp-dried clothes without attention would become increasingly popular, as would built-in electric airing cupboards. The Clean Air Act would hasten the change from solid fuel to electric water heating. Non-storage water heaters, better described as "fixed kettles," would be popular, not only in the kitchen, but in the bathroom. Dish-washers were becoming cheaper, and electric incinerators would become more common, especially in flats, as would ventilation by electric exhaust fans, electric knife sharpeners and coffee grinders. Underfloor heating would be installed in many more new homes.

"INTERPLAS 61"

OVER 350 firms from thirteen countries have already booked display space at this year's International Plastics Exhibition to be held at Olympia, London, from 21st June to 1st July. Concurrently with the Exhibition the International Plastics Convention will take place; the theme will be thermoplastics and current technical and commercial progress in this, the fastest-growing section of the plastics industry, will be surveyed.

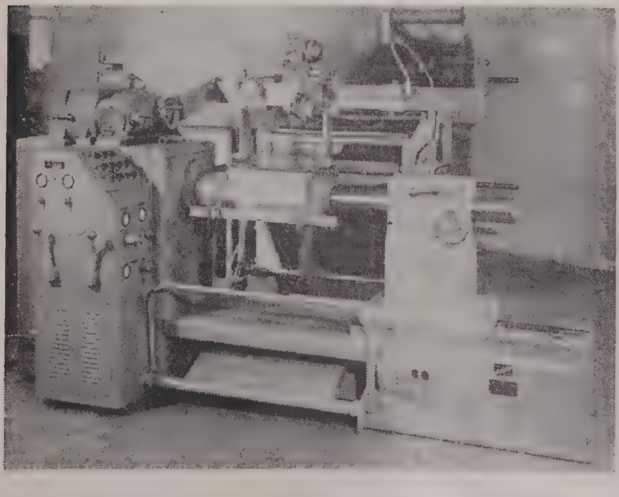
The very wide variety of industries employing plastics will find matter of interest and value in the Exhibition including building, packaging, shipbuilding, motor-car production, clothing and textiles, household goods, engineering and refrigeration. The list of exhibitors includes a number of electrical and allied concerns as well as suppliers of material to the electrical industry.

Some idea of the nature and scope of the display was gained from a film, "Plastics on Show," exhibited in London last week which is based on previous exhibitions. This is available on free loan from Iliffe Exhibitions, Ltd., Dorset House, Stamford Street, London, S.E.1, who are organising the Exhibition on behalf of *British Plastics* and *International Plastics Engineering* with the co-operation of the British Plastics Federation.

Coil Winding in Aluminium Foil

DURING recent months there has been a growing interest in electric transformers with aluminium foil and strip windings, and this is shown by the relatively large number of such items at the Electrical Engineers Exhibition. Alcan Industries, Ltd., and their associated company, Aluminium Laboratories, Ltd., are continuing a research programme on this development. The production of coils made from aluminium foil, however, necessitates a somewhat specialised type of winding apparatus. George H. Alexander Machinery, Ltd., of 82-84, Coleshill Street, Birmingham, 4, are the British agents of the Globe Tool & Engineering Co. of America, which specialises in the manufacture of aluminium foil transformer coil winding machines and has already built for American transformer manufacturers eight of the machines illustrated.

Such machines, which are capable of winding aluminium foil up to a maximum width of 22in, are particularly suited to making coils for the distribution type of transformer. Foil of various thicknesses may be used and provision is made for the inter-winding of paper or other kinds of insulation. Fisher's Foils, Ltd., of Wembley, Middlesex, specialises in making aluminium foil to required specifications.



Globe coil winding machine for aluminium foil

Improvement in Boards' Appliance Sales

Although in some cases still below the level of a year ago, sales of domestic appliances included in the Electricity Council's monthly list show signs of a recovery. This was particularly so in the case of refrigerators, as will be seen from the accompanying table. More cookers, immersion heaters and wash-boilers were sold than in January, 1960, and in the remaining classes of equipment the falls were less than recorded in December. It should be remembered, of course, that Area Boards' sales represent only a part of the total throughout the country.

Appliance	Month ended 31st January		Twelve months ended 31st January	
	Total	Change %	Total	Change %
Cookers ...	25,047	+ 5·4	341,100	+ 1·2
Water Heaters:				
Immersion ...	9,455	+19·7	193,998	+ 2·4
Storage ...	4,766	− 2·5	67,291	+10·4
Wash Boilers	4,847	+ 1·6	56,096	−15·0
Washing Machines ...	8,751	−31·2	107,154	−33·4
Refrigerators	6,419	+47·9	141,369	−14·8
Clothes Dryers	7,893	−26·5	55,113	n.a.

RADIATION GROUP SHOWROOM

NOVEL architectural treatment has been given to the new showroom of Radiation, Ltd., at 59-65, Baker Street, London, W.1. The showroom, which was first opened at the beginning of this year, is now fully equipped and a wide range of appliances for both domestic and commercial applications are on view. The display includes cookers, space heaters, water heaters, refrigerators, vacuum cleaners, home laundry appliances, as well as central heating and catering equipment, and electric lamps—all products of the Radiation Group.

An unusual feature of the display is its coverage of all the usual domestic fuels—electricity, gas, solid fuel, oil and bottled gas—and the showroom area has been divided into zones for each fuel. It covers a floor area of approximately 8,000 sq ft and coloured transparent screens are used to sub-divide the various products. Much of the equipment on show is connected for demonstration purposes. There are also special displays for architects, builders and heating engineers on the appropriate application of each appliance.

The showroom was designed by Denis Pugh, A.R.I.B.A., and is staffed by a team of nine, including the showroom manager.

In this section of the Radiation Group's new London showroom the range of Jackson electric cookers can be seen

Shift Rates and Allowances

At a meeting of the National Joint Industrial Council for the Electricity Supply Industry on 16th March a recommendation of the Negotiating Committee that the shift rate payment of 4·25d an hour should be increased to 4·5d was confirmed. The shift allowance for foremen is increased from £75 to £80 per annum for two-shift working and from £100 to £120 per annum for three-shift working. All the increases start from the first full pay period following 16th March.

It was also agreed that a boiler cleaner who works in a boiler shall be paid: (i) within 0-48 hours of the boiler being shut down, the day rate plus 2s 6d per hour; (ii) within 48-72 hours of the boiler being shut down, the day rate plus 6d per hour; and after 72 hours of the boiler being shut down, the day rate. This change is effective retrospectively from 17th November, 1960. Approval was also given to a recommendation that Electricity Boards must arrange time off for overtime worked or, alternatively, if time off cannot be arranged or is inconvenient, compensatory payments shall be made at the end of each three months.

WINDOW DISPLAY COMPETITION RESULTS

The Northwich, Kirkby (St. Chads), and Middlewich Service Centres of the Merseyside and North Wales Electricity Board have been adjudged winners in Classes 1-3, respectively, of the spring window display competition organised by the Board. All the Service Centres in the Board's area, totalling more than 70, took part. Class 1 was for Service Centres of any size; Class 2 for those with not more than three assistants; and Class 3 for one-man establishments. This year's contest was based on the theme of "Home Laundry."

Rural Electrification in the North East

AT a small informal gathering Mr. Rupert Speir, M.P. for the Hexham Division of Northumberland, recently switched on an electricity supply to High Holms farm, Steel, Hexham. This connection marked the completion of a programme for providing supplies of electricity from the Board's system to 85 per cent of all farms in the North Eastern Area. The chairman of the Board, Mr. G. N. Green, took the opportunity of thanking the National Farmers' Union, the Ministry of Agriculture, county planning authorities and the Press for the assistance they had given the Board in this important work.

This photograph, taken at High Holms Farm, shows Mr. Rupert Speir, M.P. for the Hexham Division, giving instructions by radio telephone for the supply to be switched on. Mr. G. N. Green, chairman of the North Eastern Electricity Board, is on Mr. Speir's left

In the North Eastern Board's area at 31st March, 1948, only about 3,500 farms were connected, representing 18 per cent of those in the area. Today, the number connected is 16,000. The objective set in 1953 to achieve 85 per cent electrification by March, 1963, has thus been reached two years sooner.

The cost of this programme, including the provision of supplies to villages, hamlets and cottages as well as farms, has been more than £7 million. Unfortunately, many farmers still only make limited use of the supply and in some cases electricity is used for little more than domestic purposes.

Transformers for Singapore

A consignment of 35 distribution transformers ranging from 500 to 1,000 kVA has just arrived in Singapore where they are to be installed by the local electricity authorities. They were supplied by the Woden Transformer Co., Ltd., of Bilston, who secured the order in the face of strong competition from Germany, Italy and Japan.

INDUSTRIAL NEWS *[continued*

Television Centre Fire Alarm System

AN extensive fire alarm system has been designed and installed by Standard Telephones & Cables, Ltd., in the B.B.C.'s Television Centre at the White City, London. A manned indicator board in the fire control room comprises a combined site plan, a four-key cordless telephone switchboard and a "missing key" alarm panel. The plan of the Centre is shown on the vertical panel and the various floors, the positions of rate-of-rise alarms, CO_2 alarms and sprinkler alarms are indicated by lamps. A "floor" lamp operates when a fire call is originated from any telephone situated on that floor. The rate-of-rise alarm indicates a sudden increase of temperature, and the CO_2 alarm will operate when a fire has actually started and carbon dioxide is released. The sprinkler alarm will operate when the rise of temperature sets off the water sprinklers. Associated with each of these lamps is a buzzer unit, both visual and audible alarms being given together. The panel holding all the hydrant keys is situated on the left of this console, and when a key is removed, a microswitch is operated, and a lamp is lit indicating the missing key position.

The fire control centre at the B.B.C.'s Television Centre

STEELWORKS FURNACES

FOR the new Tinsley Park works of the English Steel Corporation, Ltd., two electric furnaces have been ordered from Birlec-Efco (Melting), Ltd. Each will have a nominal capacity of 100 tons, a nominal electrical rating of 35 MVA and a shell diameter of 22ft. "Birlefco" amplidyne electrode control and a recently developed method of low reactance connection are to be used. The transformers will be of A.E.I. manufacture and the main circuit-breakers will be Reyrolle units.

A similar furnace of 100 tons capacity and a shell diameter of 22ft, but with a nominal electrical rating of 25 MVA, is to be installed at the Hallside works of Clyde Alloy Steel Works, Ltd. In this installation the transformer and circuit-breaker will be of English Electric manufacture.

B.E.A.M.A. Export Conference

As one of the special activities during its fiftieth year of incorporation, the British Electrical & Allied Manufacturers' Association is arranging an Export Conference to be held on 5th and 6th October next. The President of the Board of Trade, Mr. Reginald Maudling, has promised to speak at an official luncheon on the first day. A full and interesting programme is being arranged.

Twenty Years' Metal Prices

Vivian Younger & Bond, Ltd., Princes House, 95, Gresham Street, London, E.C.2, have sent us a copy of their latest chart showing the course of prices of copper, lead, zinc and tin month by month for the years 1941 to 1960 inclusive.

Reactor Course

The Harwell Reactor School is holding its next two-week course for senior technical executives from 8th to 19th May. For the first week, participants will be at the School and for the second at Durley Hall, Bournemouth. The fee for the course is fifty guineas (excluding accommodation). Details of this and other courses can be obtained from the Manager, Reactor School, Atomic Energy Research Establishment, Harwell, Didcot, Berks.

SOUND EQUIPMENT EXHIBITION

An exhibition, at which recent developments by E.M.I. in sound equipment for scientific, medical and entertainment applications, will be visiting 76 towns in the United Kingdom during 1961. The display comprises sixteen stands and many of the exhibits are demonstrated. Equipment on show ranges from an electronic stethoscope and a portable radioactivity contamination monitor through hearing aids and "Selectone" acoustic filter devices which suppress unwanted background noise whilst permitting conversation to continue, to wire and tape recorders and record reproducers.

E.A.W. Teachers' Conference

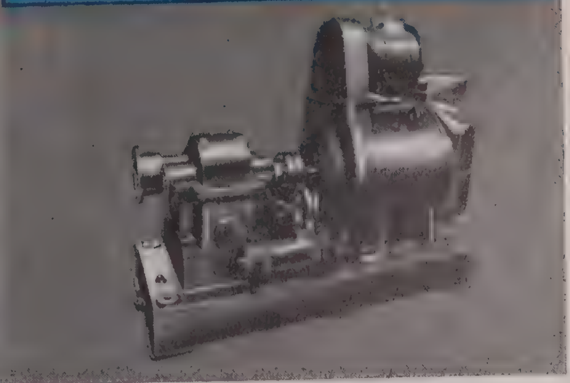
Nearly 70 teachers attended a one-day conference on the teaching of electrical housecraft at the Yorkshire Training College of Housecraft on 4th March. The two morning sessions covered electrical laundry and electrical cookery in the housecraft syllabus, and were dealt with respectively by Mrs. M. E. Pickford, B.Sc. (E.A.W. education officer), and Miss M. Carter (senior housecraft adviser, Yorkshire Electricity Board). In the afternoon Miss M. J. Gordon, M.A., B.Sc. (senior science mistress, Godolphin and Latymer School, London), discussed the teaching of electrical housecraft in schools, and Miss Mary George, M.B.E. (director of the E.A.W.), spoke of the Association's educational programme.

CABLE EXTRUDER FOR SPAIN

A Davis-Standard 6in British thermatic extruder for cable covering is being supplied to Pirelli's associated company in Spain by Fawcett Preston & Co., a company in the Metal Industries Group. The machine, which will have a 200 h.p. drive, will be capable of covering up to 5½in diameter with a plastic protective sheathing.

ROTAX COMPLETE GENERATING TEST EQUIPMENT

Designed specifically for the overhaul of aircraft generating equipment, giving precision results over a wide speed range. Built for testing the generating systems of ELECTRA, VISCOUNT, BRITANNIA, FRIENDSHIP, ARGOSY, CARAVELLE AND VANGUARD AIRCRAFT.



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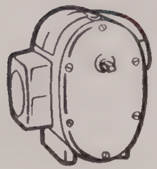
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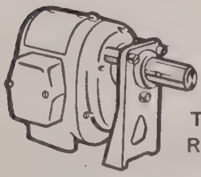
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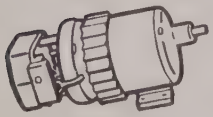
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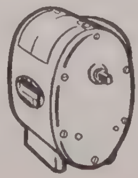
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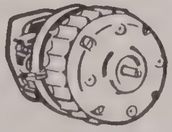
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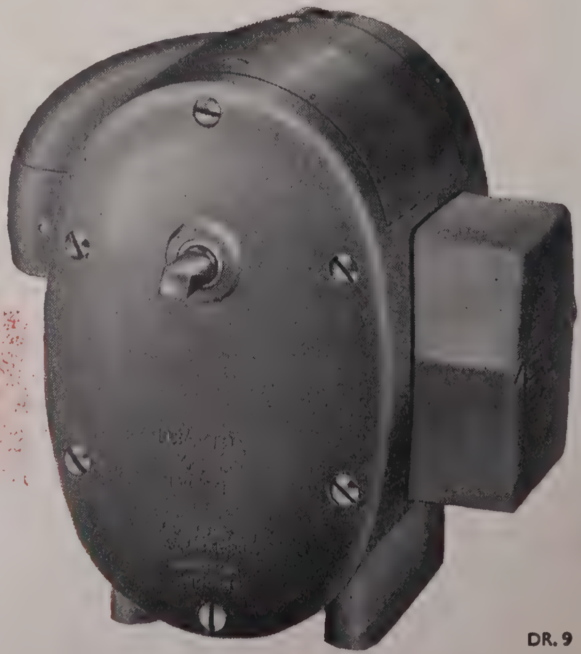

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Euratom Fusion Research Contract

A CONTRACT for co-operation on the promotion of experimental and theoretical research into controlled thermonuclear fusion has been concluded between the European Atomic Energy Community (Euratom) and the Plasma Physics Institute (principal associate: Max-Planck-Gesellschaft), Garching (near Munich).

The contract will cover an initial period of three years. The total cost of the project is estimated at DM.30 million, 33 per cent of which will be borne by Euratom and 67 per cent by the Plasma Physics Institute. Once the laboratories now being built at Garching are completed, some eighty scientists and engineers will be employed there.

The Euratom Commission is already participating in fusion research through two contracts: (1) with the French Commissariat à l'Energie Atomique (C.E.A.) (under the terms of this contract, 104 scientists are working at Fontenay-aux-Roses) and (2) with the Italian Comitato Nazionale per l'Energia Nucleare (C.N.E.N.) (some 60 scientists are employed at Frascati on research work under this contract).

Negotiations for the conclusion of another contract in this field with the Nuclear Research Centre at Juelich (Germany) are in progress.

Metal Sculpture for Thorn House

On Sunday the longest piece of modern metal sculpture to be seen in Great Britain was hoisted into place on the side of Thorn House, headquarters of Thorn Electrical Industries, Ltd., in Upper St. Martin's Lane, London. This massive abstract is 80ft tall and weighs six tons. Cast in bronze, it is a symbolisation of "The Spirit of Electricity," based upon the appearance of an electric lamp filament.

The sculpture is the work of Mr. Geoffrey Clarke, one of the chief designers of the stained glass in the new Coventry Cathedral.

Order for Four 350 MW Sets

AN order for four 350 MW turbo-generator sets has been received by the General Electric Co., Ltd. These sets, which are valued at more than £8 million, are for installation in the Tilbury "B" generating station of the Central Electricity Generating Board. Each 3,000 r.p.m. turbine will be of the tandem compound type operating with steam conditions at the turbine stop valve of 2,300 p.s.i. and 1,050°F with reheat to 1,050°F and exhausting at a vacuum of 28·9 in Hg. Generation will be at 20 kV and the alternators will have water cooled stator windings and direct hydrogen cooled rotor windings. The first two machines are planned for commissioning in 1965 and the remaining two in 1966.

Contract Price Formulae

THE British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. The rate of pay for adult male labour effective since 26th December is deemed to be 213s 6d. The "costs of materials" figures are: For electrical machinery and equipment the Board of Trade index figures published on 17th March are 181·2 (1949=100) and 116·8 (1954=100); both figures are provisional. For turbo-generating and allied plant: Materials used in mechanical engineering industries 190·1 (1949=100) and 126·5 (1954=100); both figures are provisional. Blast furnaces and iron and steel melting and rolling (1948 S.I.C. Ref. 40/41) 189·3 (1949=100) (provisional) and other steel goods, excluding tubes (1958 S.I.C.), 129·0 (1954=100). The price of ¾in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 17th March) is 49¼d/lb.

Birmingham Engineering and Building Centre

THE Birmingham Exchange and Engineering Centre, founded 100 years ago as the Birmingham Metal Exchange, is in future to be known as the Engineering and Building Centre, Birmingham. The last annual meeting of the Exchange and Engineering Centre was held on 9th March. Before the end of this year the Centre will be installed in its new permanent exhibition hall at the former Masonic Temple in Broad Street, Birmingham.

Since 1954 the Centre has been developed as a permanent exhibition for Britain's engineering industry, and it has also been responsible for organising joint engineering displays at many overseas trade fairs. In future it will provide ample exhibition space and informative services for the building as well as the engineering industries. The Masonic Temple has space for nearly 300 engineering and 300 building exhibits. The centre is non-profit-making.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £186 0s 0d
COPPER, H.C. Electro	ton £226 15s 0d
Fire Refined 99·7%	ton £225 0s 0d
Fire Refined 99·50%	ton £224 0s 0d
COPPER Tubes	lb 2s 1⅞d
Sheet	ton £259 5s 0d
H.C. wire and strip	ton £277 5s 0d
LEAD, English	ton £67 5s 0d
Foreign	ton £66 0s 0d
MERCURY	flask £69 0s 0d
TIN, block (English)	ton £821 0s 0d
ZINC, G.O.B. Foreign	ton £84 10s 0d
BRASS Tubes (solid drawn)	lb 1s 9⅝d
Wire	lb 2s 8½d
PHOSPHOR BRONZE Wire	lb 4s 1d
PLATINUM	oz £30 5s 0d
RUBBER, No. 1 R.S.S. spot	lb 25⅞d—26d

Sign Makers' Activities

In the report of the Electrical Sign Manufacturers' Association for 1960-61 reference is made to the sign competition, which attracted a record number of entries; the active part played by the Association in the work of the Outdoor Advertising Industry Advisory Committee; the help given to members in appeals against refusal of permission to erect signs—37 per cent successful; and technical activities, including investigations into polythene tube supports, p.v.c. high-voltage cables, firemen's switches and luminosity.

At the annual general meeting Mr. S. D. Moyse was elected president, to succeed Mr. G. S. Campbell, and Mr. J. H. G. Pearce vice-president.

E.C.A. DIRECTORSHIP

In this issue the Electrical Contractors' Association and its allied organisations (the National Federated Electrical Association and N.E.C.T.A., Ltd.) are advertising for a chief executive officer to succeed Mr. L. C. Penwill, the director, who is retiring next February.

TRADE ANNOUNCEMENTS

E.C.C. Moulded Breakers, Ltd., have appointed Mr. H. B. Newton as sales engineer for the Yorkshire area. He will be based at Bushbury House, 4, Laurel Mount, St. Mary's Road, Leeds, 7.

The Birmingham depot of **Pritchett & Gold and E.P.S. Co., Ltd.,** has been moved to 234, Stratford Road, Shirley, Solihull, Warwicks. (telephone: Shirley 6661/2).

Interlas, Ltd., of 9, Church Street, Ampthill, Bedford, are now marketing in Great Britain the full range of products of the Tec Torch Co. of U.S.A. This range includes air-cooled and water-cooled argon welding torches in both pencil and angled types for manual welding, machine torches for automatic welding and spot guns with control units for spot welding. Air-cooled models can be supplied in either 100 A or 130 A capacities, while water-cooled and machine torches are of 350 A capacity. The Tec spot gun is a water-cooled 350 A portable tool.

The **Press & Shear Machinery Co., Ltd.,** 172-178, Victoria Road, Acton, W.3, have been appointed sole distributors and licensees for the range of upstroking hydraulic press brakes manufactured by Promecam S.A., of France.

The address of Mr. E. A. Molyneux, northern representative of **Tyrad Electric, Ltd.,** is now "Hillside," Stubbing Road, Marsden, near Huddersfield (telephone: Marsden 401).

G. A. Platon, Ltd., have moved to a large modern factory at 281, Davidson Road, Croydon (telephone: Addiscombe 1168).

The **West Insulating Co., Ltd.,** has moved to 1, Scotts Road, Bromley, Kent (telephone: Ravensbourne 8588/89).

New "Daily Mirror" Building

In connection with the electrical installation in the new *Daily Mirror* building at Holborn Circus, London, which was described in our issue dated 10th March, we are informed that Pirelli-General Cable Works, Ltd., supplied 435 miles of v.r.i. and p.v.c. cable, 3½ miles of mains cable and 45 miles of conduit and conduit accessories.

Price Increase

The price of the Sunbeam "Mixmaster" X12B-W is to be increased to £19 14s 8d, plus £3 12s 2d purchase tax, as from 4th April.

PARLIAMENTARY REPORT

Scottish Electricity Supply

The North of Scotland Hydro-Electric Board was a great deal more than an electricity authority—it had become almost a godfather to the Highlands, Viscount Colville of Culross told the House of Lords last week. He had initiated a debate which lasted nearly four hours on the future of electricity supply in Scotland.

Lord Colville said that since the Board came into existence there had been two technical innovations of great importance—the advent of nuclear power and the high-pressure, high-temperature coal-fired thermal generating station, such as at Kincardine. He thought it would be found that the balance would be weighted against any extensive use of hydro power for base load in the future, but there would be exceptions in the north and west of Scotland. He also hoped that the Departmental Committee would consider whether the South of Scotland Board and the Hydro Board might amalgamate, if the position of the north could be guaranteed against being overwhelmed by the more populated and industrialised south.

Lord Citrine, chairman of the former Central Electricity Authority, said it would be foolish not to use hydro power. It was heavy in capital cost but very low in running charges. The country had a fuel problem and this had to be kept in mind all the time. He knew both the South and North of Scotland Boards to be efficient and both had considerable plans for expansion. He was sure they would emerge with credit to themselves in any forthcoming inquiry.

Lord Craigton, Minister of State, Scottish Office, replying for the Government, said the achievements of both Scottish Boards were notable. In 12 years the number of consumers had risen from 200,000 to 400,000 and 90 per cent of the population now had a supply. Since 1945 an average of 5,000 jobs a year had been provided on hydro-electric construction schemes in the North of Scotland and 100 miles of public road had been built or reconstructed as part of these schemes.

One of the problems facing the Departmental Committee was the extraordinary diversity in type and output of the Scottish generating stations. The North and South had between them 50 hydro-electric stations, of which seven were in the South, 13 steam stations, of which two were in the North, and seven diesel stations, all in the North.

Lord Craigton said that in the case of Loch Awe, both Boards were satisfied that by the mid-1960s conditions would be suitable for a pumped storage project from which both Boards would benefit. The scheme would be cheaper both in production and capital costs and more flexible in operation than any alternative method of operation. The capital cost of the pumped storage section of the scheme, including an allowance for transmission, was estimated at £44/kW installed as against £50 to £55/kW if a new station had to be erected in the South of Scotland.

The place of pumped storage in the economy of Scottish electricity supplies was another point on which the Departmental Committee would no doubt advise. Its writ was wide enough to cover the question of whether any Exchequer assistance was needed to complete rural electrification in the North of Scotland. Amenity considerations were covered under the Hydro-Electric Act, but the Secretary of State was considering with local authority associations whether any further steps could be taken.

Motorway Lighting

The Minister of Transport, Mr. Marples, stated in a written Parliamentary answer recently that he saw little practical advantage in a pilot scheme for the lighting of motorways. Replying to Mr. C. Royle, he said he did not intend at present to light rural motorways while heavily trafficked all-purpose roads, where the hazards from pedestrians, cyclists, general traffic movement and obstructions were greater, remained unlighted.

South Bank Telephone Cables

It will take about four months to lay additional telephone cables required for building developments at South Bank, near Westminster Bridge, said the Postmaster General in a written reply. Additional ducts and manholes would be needed between Westminster Bridge and York Road. He added that the work was urgent and every effort would be made to minimise inconvenience.

University Nuclear Research

The Nimrod proton synchrotron at the Rutherford Laboratory of the National Institute for Nuclear Research should become available for use by university research workers by 1963, said Mr. Denzil Freeth, Parliamentary Secretary for Science, in a written answer.

BATTI-WALLAHS' LADIES' NIGHT

Personalities at the Batti-Wallahs' Society ladies' night:—1. Mr. J. S. A. Bunting (president), Mrs. Bunting and Mr. H. E. Fleetham. 2. Mr. and Mrs. W. N. C. Clinch, Mrs. D. Wood, Mrs. E. W. Marchant and Mr. D. Wood. 3. Mr. and Mrs. K. Bentley and Sir John and Lady Hacking. 4. Mr. R. H. Gummer (past-president), Mr. and Mrs. J. Mayer, Mrs. F. H. S. Brown and Cmdr. The Hon. D. D. E. Vivian. 5. Mr. L. Rotherham, Mrs. D. D. E. Vivian, Mr. F. H. S. Brown and Mrs. Rotherham. 6. Sir Robertson King and Mr. O. W. Minshull. 7. Mr. Bjarne Lien (from Norway, the only overseas member of the Society), Mrs. H. E. Fleetham and M. Jean Lavoye (from France)

THE ladies' night of the Batti-Wallahs' Society has now come to be regarded as one of the major social functions of the London electrical season and this was evident from the large gathering of members and friends at the Connaught Rooms last Friday. The 350 or so guests were received by Mr. J. S. A. Bunting, the president, and Mrs. Bunting.

Following the usual custom, speech-making was kept to the minimum and apart from the loyal toast the only toasts were those to the president and to the ladies. The first was proposed by Mr. J. Temple Hazell (immediate past-president) who recalled the early days of the Society, a period that was beset with austerity and a number of difficulties.

In responding, Mr. Bunting spoke of his happy year of office and expressed his thanks to the Committee for the way in which they had supported him. He also paid tribute to the work done by Mr. H. E. Fleetham (hon. secretary and treasurer) and to the assistance given by Mr. J. C. Robertson.

The time-honoured toast of "Sweethearts and Wives" was gracefully given by Mr. J. W. Perkins (past-president) and Mrs. Bunting, replying on behalf of the ladies, thanked the Society for a delightful evening.

The dinner was followed by dancing and during the evening Eric Ross entertained the company with his Dazzle Cabaret.

E.D.A. Public Speaking Competition

THIRTEEN women and twelve men will appear in this year's national finals of the E.D.A. Public Speaking Competition. There have been just over 300 entries for the competition, which is again a record number.

The finals will be held at the Connaught Rooms, Great Queen Street, London, W.C.2, on 10th (women) and 11th May (men). Both sessions will commence at 10 a.m., continuing in the afternoon after a luncheon break.

The men's section will be judged by Miss Mary George, M.B.E., director of the E.A.W., Mr. Frank Phillips, of the B.B.C., Mr. J. Clifford Turner, of the Royal Academy of Dramatic Art, and Mr. R. G. Bellamy, O.B.E., T.D., M.Eng., M.I.Mech.E., education and training officer of the Electricity Council. Miss George and Mr. Phillips will also judge the women's section together with Miss Audrey M. Bullard, of R.A.D.A., and Mr. D. Williams, B.A.(Hons.), deputy education and training officer, Electricity Council.

The present holders of the Faraday Silver Challenge Shields are the Yorkshire Board (women's section) and the South Western Board (men's section).

PERSONAL AND SOCIAL

News of Men and Women of the Industry

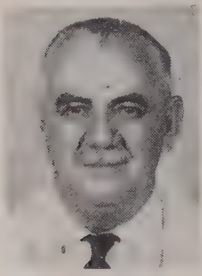
Among the distinguished scientists elected Fellows of the Royal Society on 16th March were **Professor H. E. M. Barlow,** Dean of the Faculty of Engineering and Pender Professor of Electrical Engineering and Director of Laboratories in the University of London, and **Dr. H. London,** deputy chief scientific officer, Atomic Energy Research Establishment, Harwell.

Mr. S. E. Goodall, M.Sc.(Eng.), M.I.E.E., director of engineering, cable, Associated Electrical Industries (Woolwich), Ltd., has been elected chairman of the National Inspection Council for Electrical Installation Contracting, and **Mr. J. D. D. Shaw,** M.B.E., managing director, James Kilpatrick & Son, Ltd., deputy chairman for the year commencing 1st April next.

Mr. S. E. Goodall

Mr. J. D. D. Shaw

Mr. C. H. Mellor, M.I.E.E., chief engineer, Rangoon Electric Supply, retired at the end of February and is returning to England. Mr. Mellor was apprenticed with the British Thomson-Houston Co., Ltd., at Rugby and subsequently served in the testing department and drawing office at the Willesden factory of the company. He was with the Shanghai Power Co. from 1926 to 1940 and joined the Rangoon Electric Tramway and Supply Co. in 1946, after service in the Indian Army. He was appointed chief engineer in 1952 and retained the position when the undertaking was nationalised the next year. Mr. Mellor's address in England will be c/o H. B. Lobb, "Trees," Clophill, Bedford.



Mr. C. H. Mellor

Two new appointments are announced by Metal Industries, Ltd. **Mr. John Black,** the deputy chairman, becomes, in addition, managing director and **Mr. Wilfred Padley** becomes deputy managing director. Mr. Black joined Metal Industries as chief accountant in 1951 and was appointed to the board in the following year. He became deputy chairman in 1956. Mr. Padley joined the group in 1956 and was managing director of Brookhirst Igranic before being appointed to the parent board in 1960.

Mr. M. J. Pleeth has been appointed marketing manager of the Brush Crystal Co., Ltd., and takes up his new duties on 4th April. Since 1947 he has been with the Plessey Co., Ltd.

Mr. S. Dodd, A.M.I.E.E., has been appointed manager of the North Western Electricity Board's No. 1 (Manchester) Sub-Area in succession to **Mr. F. Linley,** who is now deputy chairman of the Board. Mr. Dodd, who is 54, received his technical education at the Manchester College of Technology and from 1923 until the industry was nationalised he was with the Manchester Corporation Electricity Department, becoming section engineer, transmission. In the Board's No. 1 Sub-Area he has served successively as mains construction engineer, construction engineer, sub-area mains engineer, and sub-area engineer.

Mr. S. Dodd

The annual dinner of the **Cromptonian Association** will be held at the Connaught Rooms, London, W.C.2, on Friday, 26th May, when the chief guest will be Sir Hamish MacLaren, K.B.E., C.B., D.F.C.

Mr. M. A. Millar, of the Benjamin Electric, Ltd., left by air on Tuesday for a tour of the Near and Middle East, calling on Benjamin distributors, agents, and oil companies. Mr. Millar will be away for just over four weeks. His itinerary includes Bahrein, Kuwait, Qatar, Basra, Baghdad, Cyprus and Istanbul.

Mr. R. F. G. Hamilton, B.Sc.(Eng.), M.I.E.E., has been appointed manager of the Servo Components Division of Elliott Brothers (London), Ltd., a member of the Elliott-Automation group. He succeeds **Mr. D. Ince,** who is taking up new duties within the group in connection with the promotion of exports of aviation equipment. Mr. Hamilton, who is 46, began his career with Waygood-Otis, Ltd. In 1948 he joined the Plessey Co. and last year became technical manager of the Servo Components Division of Elliott Brothers (London), Ltd.

Mr. R. F. G. Hamilton

Mr. E. J. Goldsmith, who has been designated as the next Mayor of Southwold, Suffolk, is a linesman with the Eastern Electricity Board.

A golf day is being arranged by the **Electrical Industries Club** to take place at the R.A.C. Country Club, Woodcote Park, Epsom, on 7th June. Members are asked to return their entry forms to Mr. J. J. Thompson, Berry's Electrical, Ltd., 85-86, Newman Street, London, W.1, by 12th May.

Mr. J. O. Bovill

Wolf Electric Tools, Ltd., announce the appointment of **Mr. J. O. Bovill,** B.Sc., as managing director of their associated company, Wolf Sales Pty., Ltd., Arthur Street, Homebush, nr. Sydney, New South Wales. Mr. Bovill, who has travelled widely on project development work in America, the Far East and Europe, graduated at Sydney University and during the war served as a lieutenant in the Royal Australian Navy.

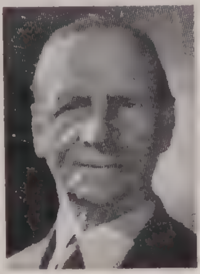
Mr. T. Penman, A.C.I.S., divisional secretary/accountant of the South Eastern Division of the Central Electricity Generating Board, is retiring at the end of this month. Mr. Penman, who has been concerned with electricity supply for just over 50 years, spent his early years with Balfour Beatty & Co., Ltd., and in 1934 he was appointed secretary of a group of companies, principally at Llanelly and Mansfield, dealing with electricity supply and traction. At vesting day he was appointed divisional secretary of the South Eastern Division at Kingston-upon-Thames and undertook the additional duties of accountant when regionalisation was introduced in 1958. He has been a member of the South Eastern District Joint Council since its inception.

Mr. T. Penman

The eleventh reunion of the **Edmundson Group** (employees of the former Edmundsons Electricity Corporation and its subsidiaries) is to be held on 28th April at the Criterion Restaurant, London, W.1. Tickets (25s 6d each) are obtainable from Mr. F. T. Scribens, Electricity Council, Room 421, Winsley Street, London, W.1.

OBITUARY

Mr. W. H. Apthorpe.—The death occurred on 17th March of Mr. William Herbert Apthorpe, M.I.E.E., of the Cambridge Instrument Co., Ltd. Mr. Apthorpe retired from executive duties at the end of 1957 but he had continued as deputy chairman. He started with the company in 1900 but in 1907 left to gain further experience with Messrs. Clarke-Fisher and R. W. Paul, later acting as assistant to Professor Donnon at Liverpool University. He returned to the Cambridge Instrument Co. in 1914 to take charge of the testing department and when Mr. Paul's business was taken over by the company in 1919 he was appointed manager of the London factory. He became a director in 1925 and was in succession director of production, joint managing director and managing director. The funeral took place at Golders Green Crematorium on Wednesday last.


The late Mr. W. H. Apthorpe

Major-General A. W. Sproull, C.B., C.B.E., B.Sc.(Eng.), M.I.Mech.E., M.I.E.E., a director of Phœnix Telephone & Electric Holdings, Ltd., died on 12th March at the age of 68. He was a past-president of the Institution of Engineering Inspection and the Junior Institution of Engineers.

Mr. B. L. Watson.—The death occurred at his home at Streatham recently of Mr. Benjamin L. Watson, joint managing director and vice-chairman of Teleflex Products, Ltd., Basildon.

Mr. E. A. Taylor, sales director of Belling & Lee, Ltd., died on Sunday last after a long illness. He was 53. Before being appointed to the board in 1953, Mr. Taylor was for many years sales and export manager. He joined the company in 1932.

E.C.A. LIVERPOOL BRANCH DINNER

THE general demand for electrical installations appeared to be limitless but during the last six months there had been a serious diminution in the call for domestic appliances, said Mr. C. R. Waterhouse, president of the Electrical Contractors' Association, at the annual dinner of the Liverpool Branch held at the Exchange Hotel, Liverpool, on 14th March. Mr. A. E. Chesters presided over a gathering of about 150 members and guests.

Mr. Waterhouse, who was replying to the toast to the E.C.A. proposed by Mr. E. L. Wiard, electrical wholesaler, said that whatever the reason for the falling off in demand in the field of domestic appliances the situation presented a challenge to the industry which must be met by concentrated effort. The electrical industry had developed during the last ten years at a tremendous rate and there was every indication that the present rate of progress could be maintained, if not increased, in the future. The vital need at the moment was to ensure that there were sufficient craftsmen and technicians to carry out the increasing volume of work. In a reference to the industrial agreement which took effect on 1st January, Mr. Waterhouse said this was designed to ensure that operatives were made to feel that they were receiving a fair deal and to provide encouragement to employees to introduce a new attitude into their activities. Craftsmen today were called upon to exercise ingenuity to a greater extent than in the past. "The vital need at the moment is to work that little bit harder," he said. "Restrictive practices and go-slow methods should be relegated entirely to the past."

In responding to the toast to the guests proposed by Mr. T. R. Jones, a past-chairman of the Liverpool Branch, Mr. W. B. Parkinson, chief commercial officer, Merseyside and North Wales Electricity Board, said that the extremely rapid development in the use of electricity would continue and would create a demand that would tax the resources of Boards and contractors to the full.

At the E.C.A. Liverpool Branch dinner (left to right): Mr. E. L. Wiard, Mr. T. R. Jones, the Lord Mayor of Liverpool (Ald. J. Leslie Hughes), Mr. C. R. Waterhouse (president, E.C.A.) and Mr. A. E. Chesters (chairman, Liverpool Branch)

ELECTRICAL ENGINEERS EXHIBITION

Last Tuesday the tenth Electrical Engineers Exhibition was officially opened by Mr. F. J. Erroll, Minister of State, Board of Trade. A detailed description of the individual stands, totalling over 470, was published last week and this issue contains an account of the opening ceremony and a survey of the main features of some of the many interesting exhibits to be seen on the stands of manufacturers and other organisations. The exhibition closes tomorrow

The tenth Electrical Engineers Exhibition at Earls Court, London, was opened last Tuesday despite severe strike difficulties. The official ceremony was performed by the Rt. Hon. Frederick Erroll, M.P., Minister of State, Board of Trade. Mr. G. G. Kitchener, national chairman of the Association of Supervising Electrical Engineers, said he was delighted that Mr. Erroll was able to come, particularly as he was a chartered electrical engineer. He recalled that at the seventh exhibition, in 1958, Mr. Erroll had mentioned that the display helped the export trade and Mr. Kitchener pointed out that this was no less true today.

Before declaring the exhibition open Mr. Erroll spoke of the technical progress made since the exhibition was first launched. Who would have thought at that time that a single-shaft turbo-generator giving 500 MW could be anything more than a very long-term possibility? In 1960 the exports of electrical machinery reached a record total at £234 million. This was a splendid achievement, and he promised the support of the Board of Trade in the industry's effort to expand exports, in which the exhibition played a vital part.

They were honoured, he said, by the presence of many distinguished representatives from overseas countries whose attendance was a measure of the world-wide interest in the exhibition. It was surely the largest display of electrical engineering equipment in the world, with more than £3 million worth of goods on show on 473 stands. He went on to say that in political and economic affairs, Great Britain did not stand aside from the rest of Europe. They were very much a part of Europe today as their membership of the European Free Trade Association showed. By the end of the year there would be an even more direct link in the form of the cross-Channel power link between England and France.

In thanking Mr. Erroll, Sir Willis Jackson (president, A.S.E.E.) referred to the educational as distinct from the commercial value of the exhibition, not only to engineers and craftsmen but also to the general public. He felt that any young man or boy with a scientific bent who came to the exhibition would have great difficulty in failing to want to become an electrical engineer. The presence of Mr. Erroll at the exhibition, he said, was an expression of the importance which the Board of Trade attached to it as a display of up-to-date achievements by the electrical industry. The fact that he was an electrical engineer

Speakers at the opening ceremony: Mr. F. J. Erroll, Minister of State, Board of Trade; Sir Willis Jackson, president, A.S.E.E.; and Mr. G. G. Kitchener, chairman of the Association

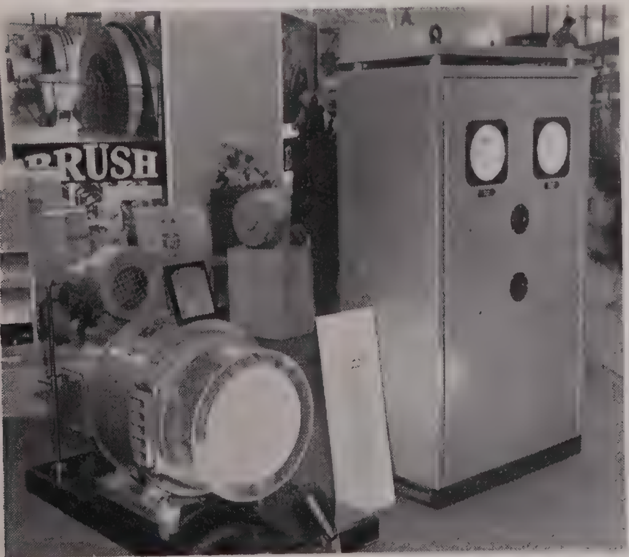
The " Electrical Review " stand at the Exhibition

ensured the presence of well-informed opinion of engineering practice at the highest level of Government and this did the electrical industry an immense service.

Prizewinning Exhibits

The prizewinning exhibits in the industrial and domestic sections were then announced and Sir Willis Jackson presented the plaques. The industrial award went to the Brush Electrical Engineering Co., Ltd., for their switched silicon rectifier motor speed control system. Ferranti, Ltd., were very highly commended for their high-speed, resistor transition, on-load tap changer intended for use on system transformers up to 33 kV working with ratings up to 10 MVA, star or delta connected.

In the domestic section the silver plaque was awarded to Easipower Appliances, Ltd., for their " Dreamland " three-heat luxury electric blanket. The construction of the blanket is such that it is claimed to be impossible for any two sections of the element to close together sufficiently to cause overheating. Heatrae, Ltd., were runners-up in this section with their decentralised heating system. This system is in the form of background heaters in a choice of sizes and loadings to meet individual requirements. Both portable and wall-mounting models of these heaters are available.



Static speed control of a 30 h.p. d.c. motor by switched silicon rectifiers shown by the Brush Electrical Engineering Co., Ltd., which won the industrial award

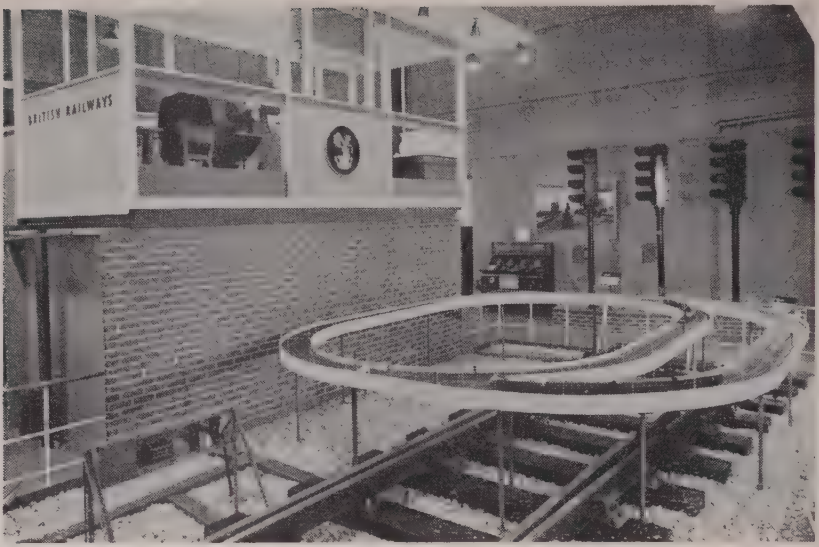
Many leading representatives of all branches of the industry attended the luncheon which followed the opening of the exhibition. Mr. R. F. Mathieson, chairman of the Exhibition Company, proposed the toast " The Exhibitors and the Success of the 1961 Exhibition." In doing so he warmly praised the exhibitors for putting on such a magnificent display and he extended a welcome to the representatives of 58 countries who were present. He said that they were being followed by many engineers and buyers from overseas. Mr. Mathieson thanked those who had acted as judges in the selection of the prizewinning exhibits, particularly mentioning Miss Mary George and her E.A.W. colleagues. He then expressed his appreciation of Mr. Erroll's kindness in consenting to open the exhibition.

He claimed that the show was bigger, better, brighter and more comprehensive than any similar exhibition under one roof and he said that it played no small part in the promotion of export trade. They were indebted to the B.B.C., the G.P.O. and other bodies which had contributed to the Communications Feature with its up-to-date picture of developments. He concluded by congratulating the British Electrical and Allied Manufacturers' Association upon attaining its golden jubilee. He mentioned the help given to the organisers by its former director, Col. B. H. Leeson, and he welcomed the present director, Mr. S. F. Steward.

The silver plaque for the domestic award was won by Easipower Appliances, Ltd., for their " Dreamland " three-heat blanket with safety-seal construction, held here by Mr. F. R. Williams, managing director

The response was made by Mr. A. M. Browne (Hackbridge & Hewittic), the new president of the B.E.A.M.A. Mr. Browne said that there were bright prospects before the industry. The new nuclear stations and the Blaenau Ffestiniog scheme would soon start to supply power, the cross-Channel power cable would soon be in service, and there were many other developments to which the exhibits drew attention. The exhibition had grown and improved every year through the close co-operation of the exhibitors and organisers and the hard work of the organisers' staff. To those who were aware of the importance of export trade and to the Minister of State, this must be very gratifying. He extended best wishes for the continuing success of the exhibition under its general manager, Mr. P. A. Thorogood.

Survey of the Exhibition



Many examples of all types of industrial, commercial and domestic electrical equipment can be seen at the tenth Electrical Engineers Exhibition which is being held this week at Earls Court, London. Over 470 manufacturers, associations and other organisations are taking part and full details of their exhibits with a plan showing the stands on each of the two floors at Earls Court were published in our last week's issue. For those who have not yet seen the exhibition, there is still time as it does not close until 7 p.m. tomorrow, Saturday.

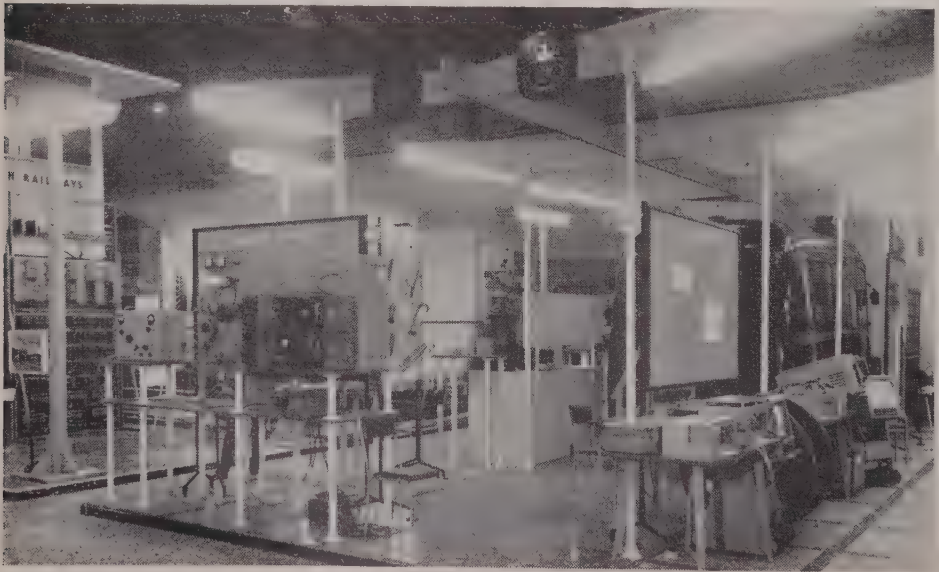
The Earls Court display is the only annual exhibition which covers the whole field of electrical power engineering and also includes a few examples of light current techniques where these find application in the power field, for example, in motor speed control gear. This year, however, electronic apparatus is in greater evidence since the main feature is concerned with communications as applied to electric railway traction, signalling and telecommunications.

The General Post Office display in the Communications Feature includes demonstrations of the latest subscriber trunk dialling (S.T.D.) techniques and the telex services. There is also a demonstration of an amplifier for the reception of signals transmitted via satellites. Communication systems using artificial earth satellites require extremely sensitive equipment to pick up the very weak signals. One amplifier that is useful for this purpose is the variable-reactance parametric amplifier and the demonstration shows a 960 Mc/s variable-capacitance type. In August, 1960, an amplifier similar to that shown was used to receive signals transmitted across the Atlantic by reflection from "Echo 1," the American 100ft diameter balloon satellite.

The G.P.O. are also demonstrating a 405-line television system, transmitted over a closed circuit from the B.B.C. television centre. Other exhibits include a buried transistor amplifier and millimetric waveguide components for use in long-distance transmission systems. The various stages of jointing coaxial cables are also being demonstrated.

The British Transport Commission's display in the Communications Feature demonstrates the use of conventional relays and electronic systems of route-setting control. The electronic system will shortly be installed at the

(*Continued on page* 543)



Above: General view of the British Transport Commission's display in the Communications Feature

Left: The General Post Office display showing the parametric amplifier in the left foreground, suitable for echo reception from a satellite

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Tensile Strength	over 3000 psi	over 3000 psi	over 2000 psi
Temperature Range	–60°F. to +250°F.	–80°F. to +350°F.	–40°F. to 600°F.
Adhesion to Fabrics	Excellent	Good	Good to Excellent
Adhesion to Metals	Excellent	Excellent	Good to Excellent
Chemical Resistance	Good	Good to Excellent	Excellent
Compression Set Resistance	Fair to Good	Fair	Very Good
Ozone Resistance	Excellent	Outstanding	Outstanding
Flame Resistance	Good	Good	Good
Sunlight and Weather Resistance	Very Good	Outstanding	Very Good
Abrasion Resistance	Excellent	Excellent	Good
Oil Resistance	Good	Good to Excellent	Excellent

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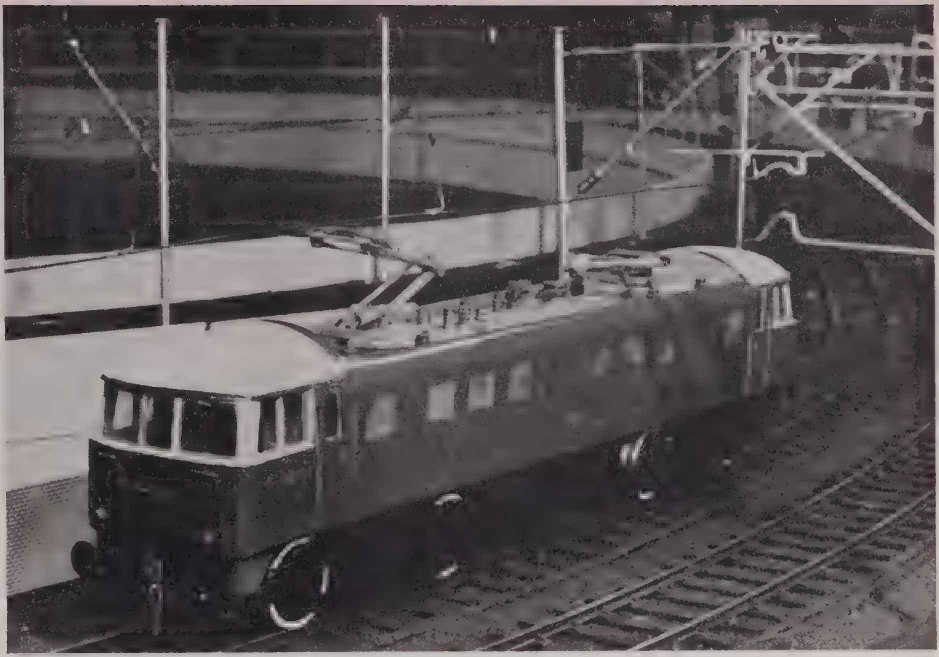


One of the model locomotives on the "O" gauge track in the British Transport Commission's feature. The overhead equipment is a scale model of that used on the 25 kV Manchester-Crewe line. Four-aspect signalling is used on the model circuit, the points and signals being controlled from the full-size signal box. One set of points is controlled by the new Mullard electronic system

Henley-on-Thames signal box for full-scale trials. Four-aspect signalling and the automatic warning system are demonstrated and static displays of railway electrification equipment by various manufacturers are included. A model railway, complete with overhead line equipment, is included in this feature, while another model railway can be seen on the Borough Polytechnic's stand.

An internal communication system to be fitted in the nuclear submarine H.M.S. *Dreadnought* is being displayed by the Admiralty. The system employs a high degree of integration between the exchange telephone system, loudspeaker intercommunication and broadcasting systems. Each outstation is provided with a transistorised microphone pre-amplifier and a loudspeaker mains amplifier. The pre-amplifier is designed for constant voltage output over a wide range of load impedance. This ensures constant performance on intercommunication working where the pre-amplifier may drive any number of main amplifiers from one to 50.

Another item of general interest is the 17ft square moving-coil meter mounted on the first floor by the Warwick Road entrance. The scale is calibrated 0-5 MW and a 5ft long aluminium pointer operates over a scale length of 20ft. The meter, which shows the total electrical load connected to the main intake to Earls Court, has been designed and constructed by Nalder Bros. & Thompson. A further feature of this year's exhibition is a lighting display in the entrance foyer which includes a combination of sound, light and colour with continually changing effects.

In the general display areas, switchgear and lighting again appear to predominate. Among the trends we have noted in the rotating machine field are semiconductor motor speed control systems and epoxy encapsulation of motor windings. Aluminium foil windings for transformers are in evidence and, in the switchgear field, the use of semiconductor controlled rectifiers for contactorless switching is increasing. Various makes of packaged substations (including transformers and switchgear) are to be seen, while the trend toward the replacement of switch fuses by miniature circuit-breakers is again in evidence.

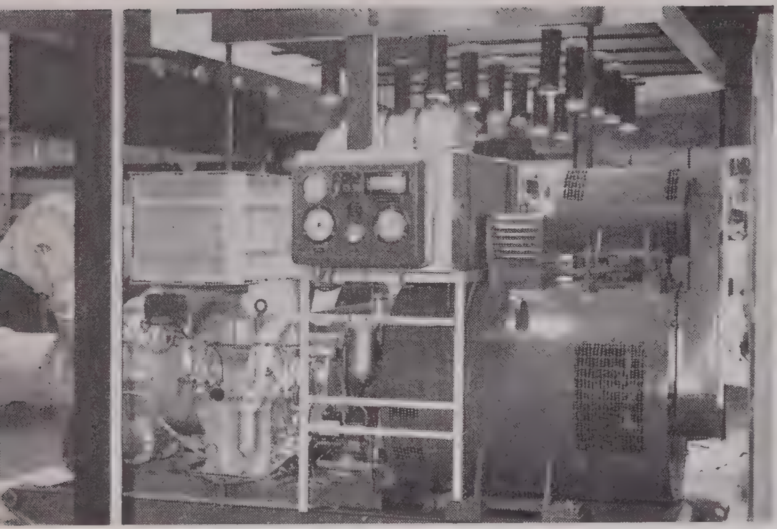
A number of firms are showing logical elements consisting of transistors, semiconductor controlled rectifiers, magnetic amplifiers and printed circuits. These can be used for the automatic control of various commercial and industrial operations. A surprising number of digital read-out instruments of all types can be seen at the exhibition and many firms producing wiring accessories are showing plastic trunking and ducting. A large number of new infra-red heaters are being shown by various firms, while in the lighting field new developments in electroluminescence can be seen on the Atlas Lighting stand.

In a survey of this nature it is obviously not possible to mention all the interesting items displayed, particularly in view of the magnitude of the show. We must, therefore, confine our further remarks to those exhibits which have come to our particular notice.

Rotary Machines

The size of main steam-driven electrical power generating units now under construction varies from 200 MW to 500 MW and these are being supplied to a relatively small number of new power stations. It is, therefore, not surprising that most of the rotating machine exhibits at Earls Court are concerned with small motor-generator sets and various types of motors. However, a replica of half of a 10ft diameter rotor showing the detailed construction of the actual rotors for the 12 MW generators for the Shin hydro-electric scheme in Scotland is being shown by Bruce Peebles & Co.

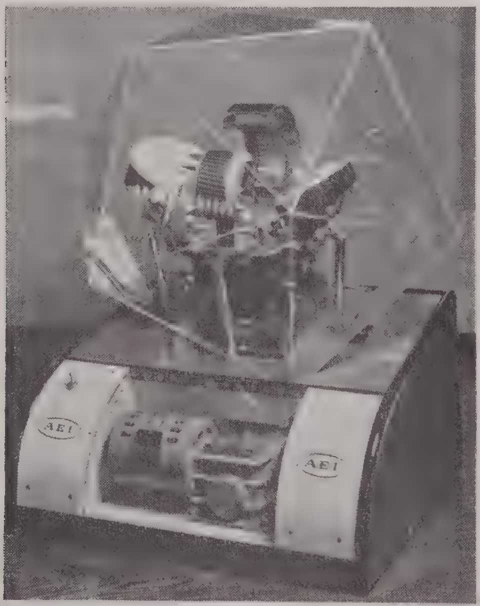
A new range of robust welding generators, featured by Petbow, have been designed for diesel drives. Amongst the motor-generator sets shown are a new 25 kW Ward-Leonard set displayed by Lancashire Dynamo & Crypto and h.f. motor-generator sets exhibited by W. Mackie and the Electric Construction Co. The vertical brushless type m.g. set on the Mackie stand is rated at 5 kVA, 400 c/s, while the E.C.C. set consists of a squirrel-cage motor and a 10 kc/s generator. This set has been designed for induction heating and similar applications and the two rotors are mounted on a common vertical shaft. The set is rated at 250 kW and operates on a 415 V, 50 c/s supply,



The new 250 b.h.p. Austin gas turbine is shown coupled to a 200 kVA generator

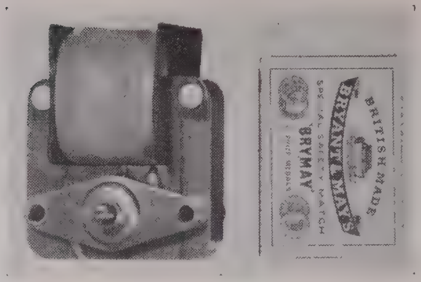
the generator output voltage covering the range from 600 to 1,200 V. Cooling is effected by a closed air circuit, incorporating a water-cooled exchanger, and the driving motor is suitable for operating from 50 or 60 c/s systems.

The numerous examples of electric motors displayed illustrate many diverse applications and demonstrate the continuous and vigorous development work that is being undertaken to ensure the satisfaction of the user. The progress in the design of motors and generators from 1858 to the present day is well illustrated on the Pinchin, Johnson stand. Most of the machines shown have been drawn from various museums throughout the country, while modern motor design is illustrated by working prototypes. An article on this subject appeared in the *Electrical Review* of 10th March.



Working model of an A.E.I. (Rugby) f.h.p. motor showing the structure

A new variable speed reversible a.c. motor, which is being shown by Mawdsley's, has a speed range from 0 to 3,000 r.p.m. with a constant torque. Full-load starting torque is exerted with only 30 per cent full-load current and regenerative braking is an inherent feature. A miniature shaded pole motor, which is shown by Rolco Engineering, is claimed to be the smallest of its type manufactured in this country. It has overall dimensions of 2¾in by 1⅞in by 1½in, an output speed of 2,400 r.p.m. and can be supplied with a gearbox. Walter Jones & Co. are also showing a new range of miniature motors. These have a diameter of 2½in and are available as servo two-phase, induction, synchronous and hysteresis types with and without gearhead. The type S range of square stack shaded pole a.c. motors, shown by Jones & Stevens, have applications in the domestic and industrial fields. The 15S motor stack measures 2¼in by 2⅞in (including shaft). New products shown by Small Electric Motors are rotor and stator units up to and including 10 h.p. for semi-hermetic industrial refrigerator units.



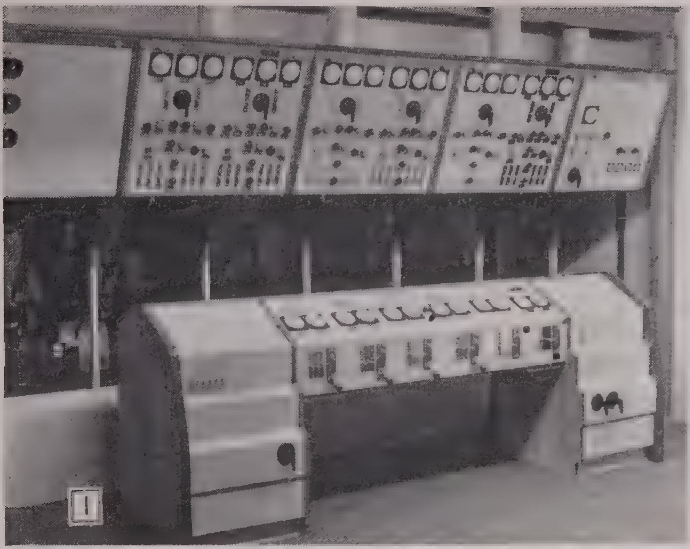
Right: One of the small shaded pole motors shown by Rolco Engineering, Ltd.

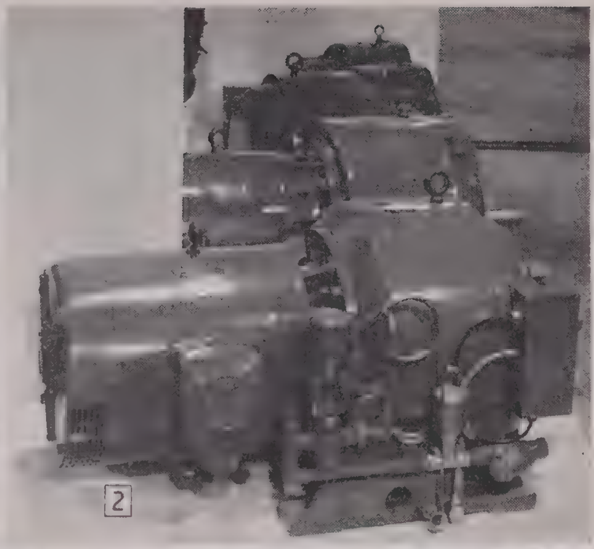
Printed armatures for small electric motors are being shown by Printed Circuits, Ltd., and the effectiveness of epoxy encapsulation is demonstrated on the Brook Motors stand by a sectional motor operating with jets of water playing on it. An example of epoxy encapsulation for all motor frames up to 125 h.p. is being displayed for the first time by Newman Industries, Ltd.

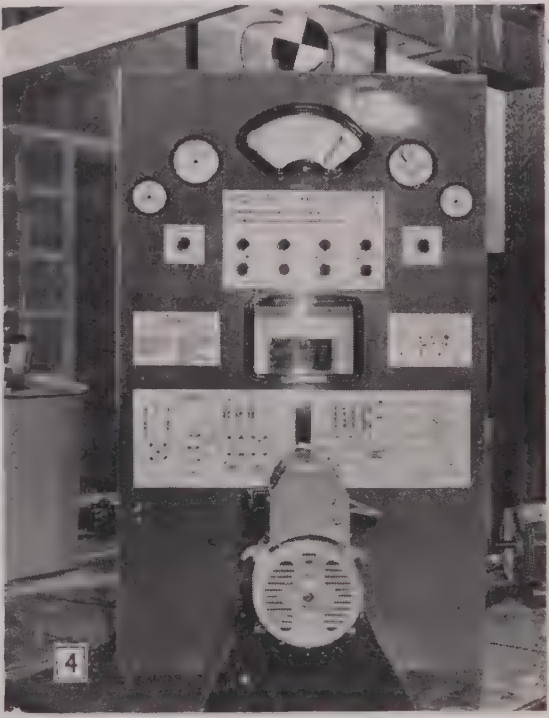
Speed Control

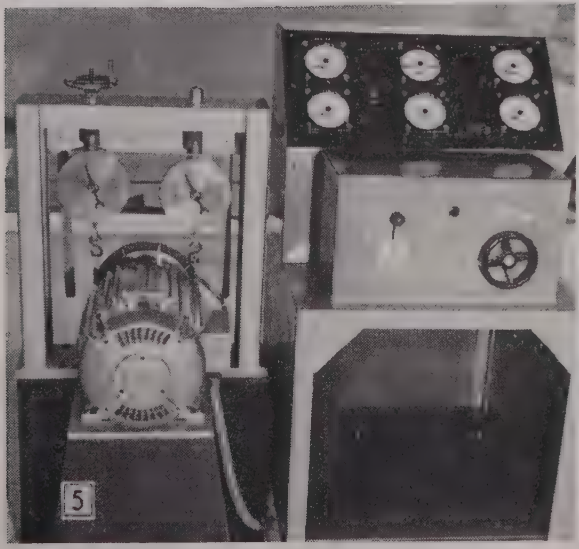
The performances of two alternative industrial precision speed control systems can be compared on the Laurence, Scott & Electromotors stand. The two systems, which

Motors ranging from $\frac{1}{250}$ to $\frac{1}{3}$ h.p. are exhibited by Fractional H.P. Motors, Ltd.







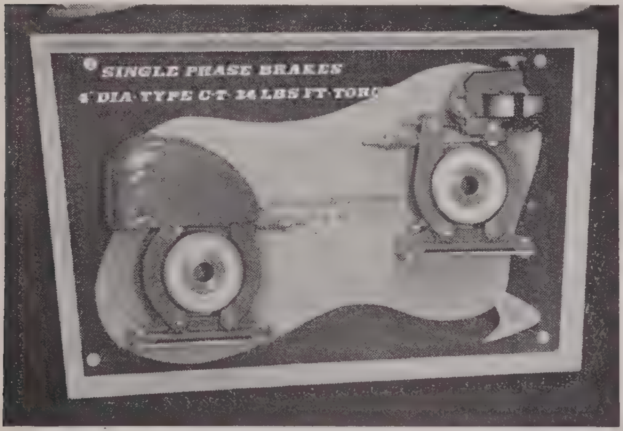


(1) The G.E.C. is featuring a 17ft control console for a hot strip finishing mill at the Llanwern Spencer works of Richard Thomas & Baldwin, Ltd. (2) A selection of variable speed drives shown by Heenan & Froude, Ltd. (3) General view of the Brush stand showing, in the foreground, a silicon rectifier speed control system demonstrated with a 30 h.p. motor. (4) A demonstration panel showing the operation of an ES11 self-regulating alternator exhibited on the Arthur Lyon & Co. (Engineers), Ltd., stand. (5) A Mawdsley's-Mensforth 2 h.p. reversible variable speed a.c. motor demonstration unit showing the 0-3,000 r.p.m. speed range and constant torque characteristic. Regeneration is an inherent feature. (6) Part of the Laurence, Scott & Electromotors stand

may be switched in turn to control the same motor, are shown applied to a d.c. motor supplied from a Ward-Leonard generator. The two systems involved are the "Velonic," which uses electronic valves (and will be available shortly with semiconductors), and the "Asmag" which uses a magnetic amplifier. Transient response times for full-load switching for both systems are of the order of ½ to 2 sec.

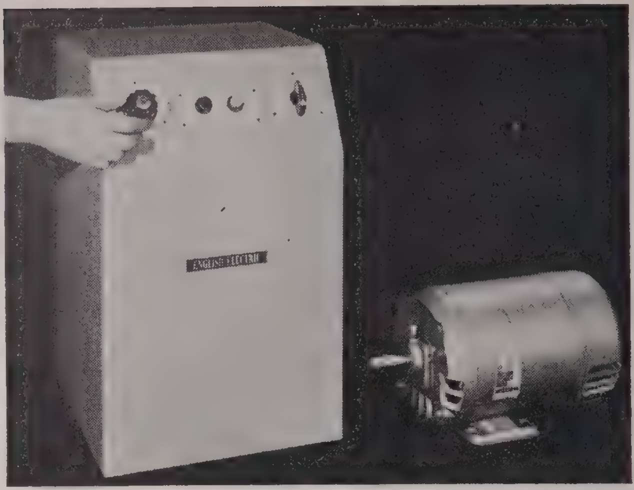
A naturally-cooled magnetic amplifier power pack for the control of a 6 h.p. a.c. motor, incorporating transductors, silicon rectifier, control chassis and necessary switchgear and dynamic braking, can be seen on the Electric Construction Co. stand. The particular example shown has been designed and built to give a response time at the motor shaft of 20 msec from standstill to 2,200 r.p.m. Control is available over a 20 to 1 speed range and speed regulation at 2,200 r.p.m. from no load to full load is within ±1 per cent. A demonstration showing the speed control of a 30 h.p. motor by means of silicon rectifier switches is being given by Brush, while a 25 h.p., 3,000-0-3,000 r.p.m. variable speed motor, equipped with electronic control providing constant speed under varying load conditions, is shown by Brunt Variable Speed Motors. Another electronic motor control system, the "Emotrol," can be seen on the A.E.I. (Rugby) stand.

A.E.I. (Rugby) are also showing their "Logicon" static switching unit and English Electric are featuring their contactorless sensing devices and transistorised logical elements from the "Unistat" range. Brookhirst Igranic's static switching system, the "Bi-Stat," is illustrated by means of models of actual installations, including the Wulpa lift car park. The "Bi-Stat" is based on transistors, magnetic amplifier devices and other miniaturised components which are totally encapsulated into standard units. Only single-wire connections are used, the circuitry being based on a common return. The current used is generally about 4 V d.c. at a few mA, amplified where necessary to operate contactors, solenoids, clutches, etc. Fourteen standard units are available and printed circuits are used.



Single-phase, 4in diameter, 24 lb-ft torque electro-mechanical brakes displayed by Elliston, Evans & Jackson, Ltd.

Apart from motor control, static systems for alternator voltage regulation are also available. Lancashire Dynamo & Crypto are showing an alternator with a self-regulating static exciter in a separate cubicle and another static excitation system for the "Stamford" L-range alternator is shown by Arthur Lyon & Co.



English Electric type ZD2 ¼ h.p. static variable speed a.c. motor controller

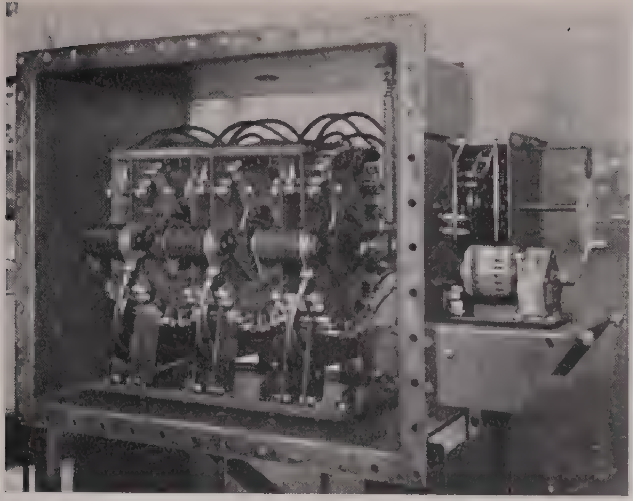
Rectifiers and Transformers

The increasing use of semiconductor devices for rectification is well illustrated by this year's display. The controlled rectifier and its applications are prominently featured. A display demonstrating the use of silicon controlled rectifiers and transistors for speed control is shown by Lancashire Dynamo Electronic Products, while controlled semiconductor devices are also exhibited by Mullard, Ltd.

A demonstration of the "Silicontrol" gate drive for the control of all silicon controlled rectifiers is given on the Parmeko stand. This comprises a phase-shifting network which applies a.c. constant amplitude pulses to the rectifier gates and varies their phase angle over 180° to control the rectifier output from zero to maximum.

The use of Westinghouse "Trinistor" silicon switching devices in complete equipments is shown, including their application in a d.c./a.c. invertor equipment having a substantially sine wave output, while the output waveform characteristics of a working model of a 100 W transistorised invertor can be studied on an oscilloscope on the Electro-Dynamic Construction Co. stand. Texas Instruments are demonstrating an XB26 silicon epitaxial mesa transistor in a technique which may well extend the use of silicon transistors in the nanosecond switching and u.h.f. fields. High-voltage rectifiers in ceramic cases are displayed by the International Rectifier Co.; one rectifier column can deliver 9 A at 70 kV for radar applications.

Although there are a number of new transformers on view, for example, the 500 kVA Hackbridge & Hewittic direct buried unit in which all oil is below ground level, the most noticeable development in this field is the increasing use of aluminium foil windings. The Bryce Electric Construction Co. are exhibiting a new 500 kVA, 11,000/423 V oil-immersed distribution transformer with both h.v. and l.v. windings of aluminium foil, while transformers with anodised aluminium foil windings are also shown by Foster Transformers. The high space factor and good cooling characteristics of aluminium foil coils is illustrated by the display on the Alcan Industries stand, which includes details of insulation and tapping techniques



A.E.I. type LA resistor-transition 17-position on-load tap changer rated at 200 A 33 kV

and methods of foil jointing by cold welding and soldering.

Bruce Peebles are exhibiting a 400 kVA transformer with a boltless mitred core and a new 300 kVA flameproof dry-type mobile transformer for colliery use, in addition to demonstrating an electrolytic analogue used to determine the initial distribution of an impulse or surge voltage applied to a transformer winding.

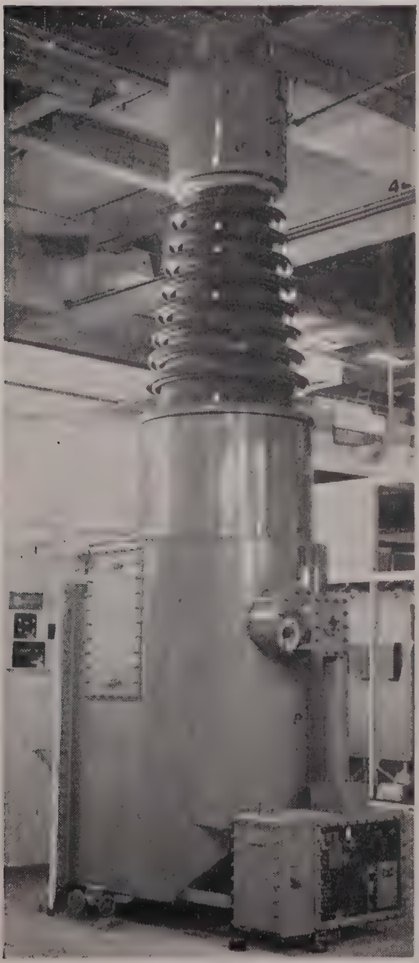
A number of exhibitors are showing core materials. Telcon-Magnetic Cores are displaying strip-wound cores in silicon iron; toroidal cores employing 47 per cent nickel iron strip material produced by powder metallurgy methods and bobbin cores using tape in thicknesses down to 0·0003in are shown by Geo. L. Scott & Co.; silicon and nickel iron laminations and magnetic shielding boxes and screens are displayed by Magnetic & Electrical Alloys; while toroidal and other cores and core laminations are shown by Linton & Hirst.

The main feature of the Hirst Electronic stand is the application of saturable reactors which are now being manufactured with ratings up to 1,250 kVA for power control, while Haddon Transformers are exhibiting a new three-phase 150 kVA saturable reactor/transductor mounted as a single unit and employing a new core configuration. The core and winding assembly of a 50 kVA saturable reactor is displayed by Ferranti, Ltd.

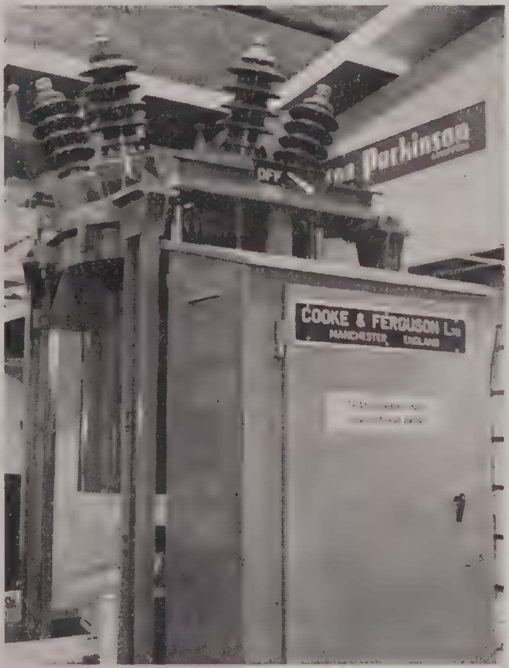
Among the transformer tap changers on view is the new A.E.I. type LA high-speed 17-position, 33 kV, 200 A resistor-transition on-load tap changer which has a motor-driving mechanism and pushbutton control and is suitable for use on transformers up to 12·5 MVA. Fuller Electric are also showing tap changers, including a skeleton single-phase 132 kV fully insulated high-speed resistor on-load tap changer and a 33 kV, 200 A high-speed unit with integral direct drive mechanism.

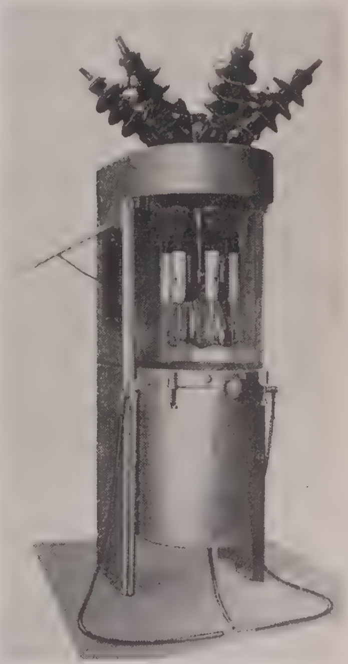
Switchgear

Once again, the bulk of the equipment on view at Earls Court falls into the broad classification of switchgear, which ranges from e.h.v. circuit-breakers to domestic switches. There have been no outstanding advances



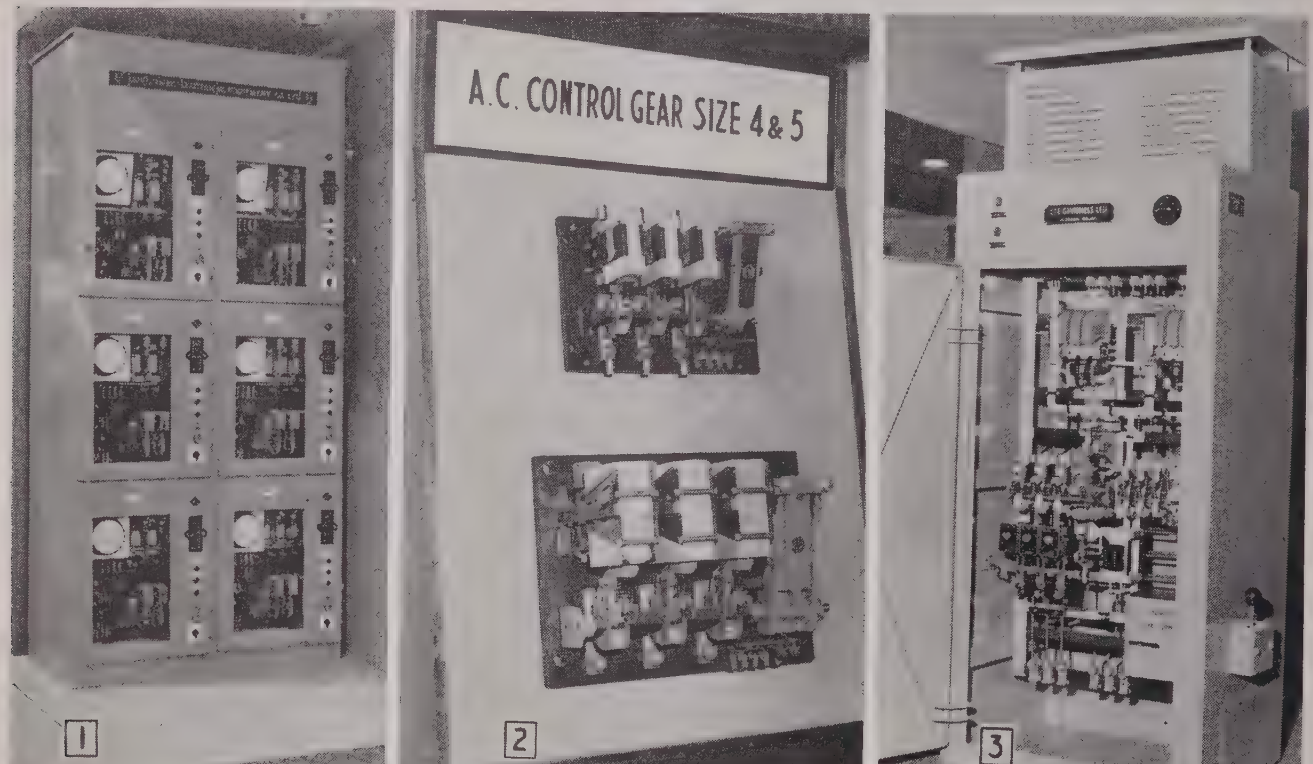
Left: A 132 kV on-load line end tap changer on the Ferranti, Ltd., stand



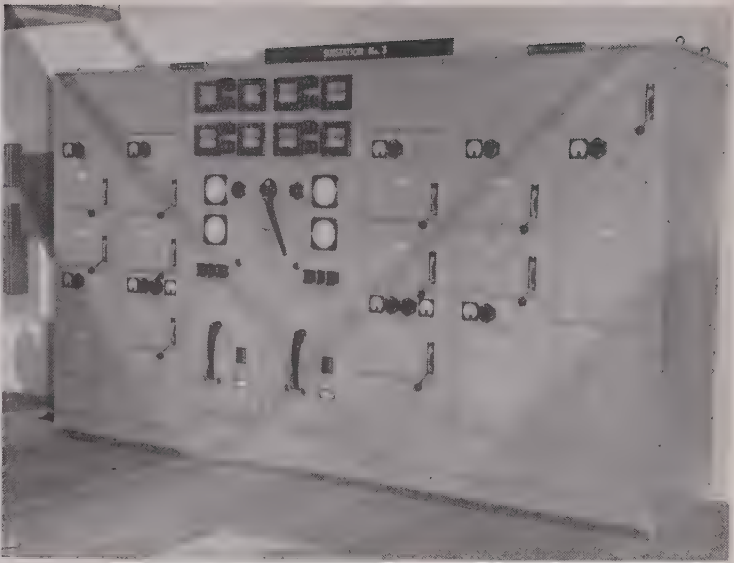


Above left: A Cooke & Ferguson 500 MVA 33 kV outdoor circuit-breaker shown on the Crompton Parkinson stand. Above right: A new 33 kV outdoor oil circuit-breaker exhibited by A. Reyrolle & Co., Ltd. The size of the top plate has been reduced by the use of shaped cast-resin bushings during the year, but the trend towards moulded resin insulation is evident. A unit from a new range of 33 kV outdoor oil circuit-breakers having ratings up to 1,200 A and 750 MVA breaking capacity is shown by A. Reyrolle & Co. The use of shaped cast-resin bushings has enabled the size of the top plate of this circuit-breaker to be reduced to the minimum, so enabling overall dimensions to be kept down. Solenoid- or hydraulically-charged spring-closing mechanisms are available, and tank lowering or raising is achieved by pull-type rams. The 33 kV oil switch, shown for the first time by Yorkshire Switchgear, is rated at 1,000 MVA fault making/load breaking.

A model of the "Weatherbeater," a new 33 kV outdoor packaged switching station, is being shown by English Electric, and W. Lucy & Co. are displaying a packaged substation consisting of a 500 kVA transformer and an 11 kV oil-immersed ring main unit. Another medium-voltage packaged substation, incorporating a 500 kVA, 11,000/433 V dry-type class C insulated transformer and medium-voltage switchgear, is shown by A.E.I. (Switch-



(1) Contactor gear for furnace control utilising six 75 A three-phase local and remote operated contactors shown by the Morecambe Electrical Equipment Co. Metering is located behind the glass panels. (2) Examples of a.c. control gear on the Donovan Electrical Co., Ltd.'s stand. (3) Lee Guinness type D/E/F starter for 440 V slip ring motors up to 100 h.p. (4) Belmos motor control gear panel with central console and mimic diagram. This can control 20 motors up to 25 h.p. each. (5) A type D494 starter board with draw-out units available for motors from $7\frac{1}{2}$ *to 100 h.p. and a flameproof motor starter board on the M. & C. Switchgear, Ltd., stand*



Left: A 17-way Mk. III cubicle type m.v. fuse switchboard shown by W. Lucy & Co., Ltd. Above: One of five switchboards being supplied by G. P. Dennis, Ltd., to control the medium voltage distribution system at the L.C.C.'s Southern Outfall development at Abbey Wood

gear Division). This company is also showing for the first time an addition to its class Q range of switchgear, an 11 kV air-insulated vertically-isolated switch unit with integral earthing incorporating epoxy resin insulated current and voltage transformers. The single-break oil circuit-breaker has bolted type epoxy resin bushings and is designed for ratings up to 250 MVA at 6·6 kV and 350 MVA at 11 kV.

The new type ULB/1 oil circuit-breaker, shown by Crompton Parkinson, is suitable for ratings of 150 MVA at 3·3 kV, 250 MVA at 6·6 kV and 500 MVA at 11 kV. The General Electric Co. are showing a new 11 kV switch-fuse ring main unit comprising two wing oil-immersed switches and a switch-fuse tee-off unit. The oil switches are rated at 400 A and the tee-off at 60 A (maximum) at 11 kV. Certified breaking capacity is 250 MVA at 11 kV. Operation of any fuse causes the tee-off switch to trip and bushings are built into the unit to enable cable testing to be carried out. The unit is suitable for indoor or outdoor use and fuses, which are air insulated, can be replaced in all weathers. The type D expulsion fuse switch and a new type of repeater fuse unit are prominently displayed by Johnson & Phillips; full details were given in our 13th January issue. A new 11 kV valve type lightning arrestor for installation on rural transformers is shown by EMP Electric, and Line Equipment are showing new rural rocking type switches.

A new range of air-break switchgear for use on voltages up to 660 V is shown by George Ellison. Each unit consists of flush-fronted sheet steel cells in which are housed horizontally-isolated, double-tiered circuit-breakers or off-load isolators and a metering panel. The breakers are available for 800 and 1,600 A current carrying capacity.

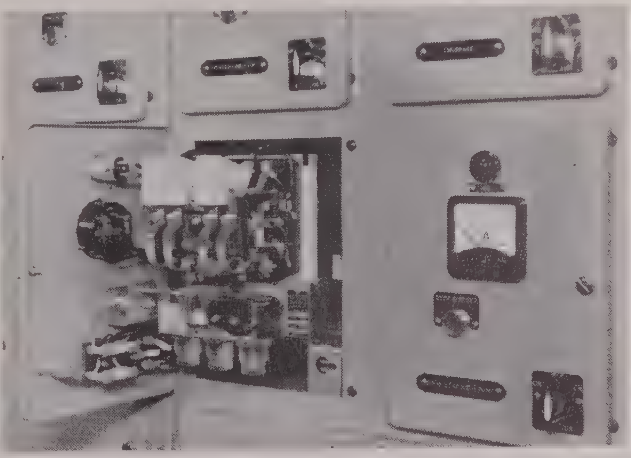
Motor Control Gear

A feature of the new tiered switchboard, shown by the Watford Electric & Manufacturing Co. is the design of the starter assembly which is mounted on a hinged door. For access to terminals or for removal of the starter, the door, complete with the starter, can be lifted from the hinges and parked at the side of the aperture. Multi-motor control cubicles of the draw-out pattern can also be seen on the Siemens Schuckert stand, while M. & C. Switchgear are showing their new "Unicube" starter boards with draw-out starters up to 100 h.p. The standard 8ft high cubicle pillars are of steel construction divided into self-contained compartments to accommodate the starters or other apparatus.

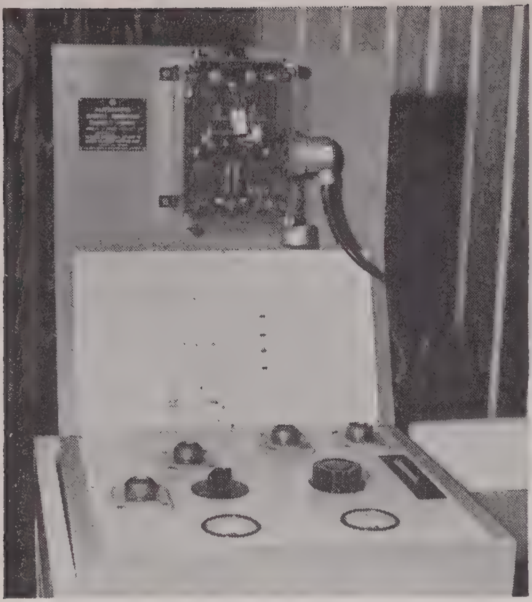
The "Unitactor" multi-starter contactor board shown by Allen West employs prefabricated bolted units containing standardised basic starters and provided with top or bottom busbars. M.T.E. Control Gear, Ltd., are staging a working demonstration of the building of control panels using their "Progress" range of control gear components.

A new range of a.c. contactors with ratings from 10 to 1,200 A is being displayed by Lee Guinness.

A new development shown by J. A. Crabtree & Co.



A new tiered switchboard exhibited by the Watford Electric & Manufacturing Co. showing the hinged door feature



A 15 A 240 V automatic earth proving supply point is being demonstrated by Nalder Bros. & Thompson, Ltd.

is the type G relay for motor control applications. The relay is rated for currents up to 10 A and it is claimed to comply with the appropriate clauses in B.S. 775 requiring a mechanical life of five million operations.

New manual controllers for battery electric vehicles and for a.c. and d.c. crane motors are shown by Expert Industrial Controls, Ltd. These incorporate a striker-operated contactor for which little operating effort is required, applied only during a brief snap-over action which is independent of the speed of actuation.

Small Switches

A new range of Cutler-Hammer " Rockette " slow-make, slow-break, rocker action appliance switches with moulded actuating rockers is shown by N.S.F., Ltd. Miniature moulded body switches are also displayed by D. H. Bonnella. Amongst the new micro-switches shown are a high-capacity double switch rated at 25 A by Burgess Products, a domestic appliance switch by Honeywell Controls and a miniature pressure switch by Londex.

A new series of slow make-and-break rotary switches, available in either three-, four-, five- or six-position types, rated at 13 A, 250 V a.c., are being shown by Arrow Electric Switches. A feature of these switches is the shallow depth required behind the panel. Austinlite are also showing new rotary switches, including those specially developed for Trawsfynydd nuclear power station. The lockable switch handles are designed to be easily identifiable by touch alone. This company is also showing a rotary switch fitted with no-volt release or star-delta release and another new product is a rotary switch designed to carry 800/1,500 A.

Miniature Circuit-Breakers

The trend toward the use of miniature circuit-breakers in place of fuse switches for both industrial and domestic applications is evidenced by the wide variety of examples to be seen on many stands. The M.C.B. Co. are showing their new miniature circuit-breaker distribution board containing units with ratings up to 400 A. A new double-pole earth leakage circuit-breaker for industrial and domestic use, shown by Chilton, has a maximum current rating of 100 A.

The increasing use of miniature circuit-breakers does not mean, however, that there have been no recent developments in the switch-fuse field. For example, an entirely new range of 900 V fuseboards is being shown by Bill Switchgear, Ltd., and George Scholes & Co. are showing a new range of special switch-fuse units for the control of normal and off-peak tariff loads.

Relays and Instruments

The protection of semiconductor rectifiers was the original purpose for which a new temperature-sensitive relay, shown by P. & B. Engineering, was developed. The working model static switching control system, shown by B. & R. Relays, is based on the fundamental " and," " or " and " not " logic functions. This company is also showing new relays incorporating vacuum switches mechanically operated by a connection through a metal diaphragm sealed inside the glass envelope of the switch. A " packaged " supervisory system demonstrated by Standard Telephones & Cables, Ltd., is designed for remote control and indication of electricity distribution networks, etc., and can work over two or four pilot cores or equivalent voice frequency or radio channels and employs coded signalling. The facilities available include remote indication of the closing or opening of up to 16 electrical contacts, remote control of up to 16 functions, two-way telephone communication and constant pilot line and out-station power supply supervision. Another control system on view has recently been developed by A.E.I. (Instrumentation Division) for the automatic control of turbines during run-up.

Relays of practically every type are on display. A new overload relay with interchangeable heaters, ambient temperature compensation and single phasing is shown by E. N. Bray, Ltd. A new Clifford & Snell transistorised relay on the stand of D. Robinson & Co., Ltd., normally requires 0·02 A at 24 V d.c. for its operation. Timing equipment is displayed by Venner, Ltd., including the recently introduced " Autopoint " portable time switch, which can be plugged into existing sockets to control elec-

Remote reading of up to 40 house service meters is possible using the Smith Meters, Ltd., repeater system trical appliances. In the new Horstmann Gear Co. "Timestat" the movement makes one complete revolution in seven days and the switching requirements for each day can be individually set. A new version of the Robert Maclaren "Thermo-Time" regulator has a capillary tube and bulb as its thermostatically sensitive medium.

Among the recording instruments on view is a new Evershed & Vignoles transistorised quick-response recorder which registers voltage transients up to 25 c/s with an amplitude error not exceeding 10 per cent for peak-to-peak amplitude of 1½in. The new Everett, Edgcumbe dwarf "Inkwell" recorder has a 4in chart and full-scale deflection can be as low as 150 μA.

Smith Meters, Ltd., are showing a repeater system enabling up to 40 house service meters to be read from one single point. On the Sangamo Weston, Ltd., stand demonstrations can be seen of meter calibration and testing and of the newly introduced "Floton" magnetic bearing. Jewel bearings for instruments, meters, etc., are being shown by J. P. Filhol, Ltd.

Photo-electric level controls designed for infra-red operation in a dusty atmosphere are demonstrated by Radiovisor Parent, Ltd., also flame failure protection equipment and working models of smoke density indicators and smoke alarms. The new series of Sifam resistance pyrometers cover temperature ranges between −200 and +500°C. The on/off controller shown by Measuring Instruments (Pullin), Ltd., uses a moving-coil instrument movement with a flag at the pointer tip interrupting a light beam directed on to a photo-transistor, the output of which operates a relay in the circuit to be controlled.

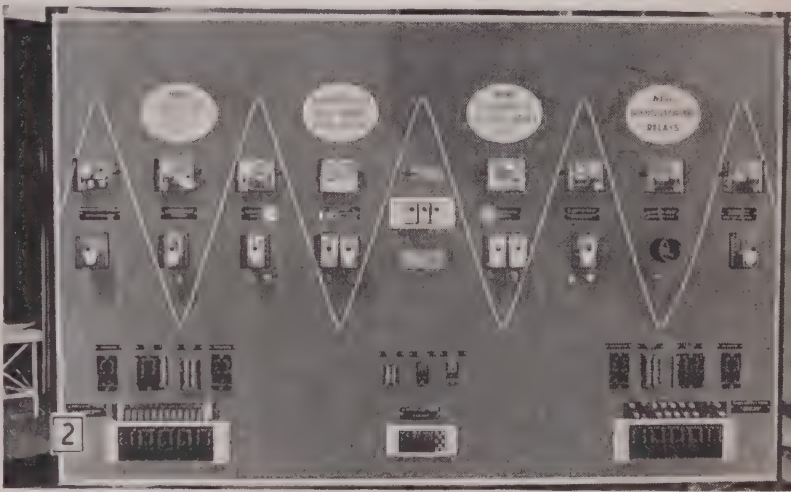
A considerable increase in the use of digital reading equipment is noticeable this year. New four- and five-digit voltmeters and a digital recorder, which accepts voltage inputs from 0 to ±999·9 V on three automatically changed ranges, are shown by Blackburn Electronics. A digital electronic counting equipment operating up to 1 Mc/s with a crystal-controlled gate accurate to one part in 10^{-7} and a seven-digit read-out is shown by J. Langham Thompson, while the "Digivisor" projection digital indicator, shown by the Electrical Apparatus Co., incorporates a lamp which projects an image on to a screen from a microfilm joined to a moving-coil element in place of the normal pointer.

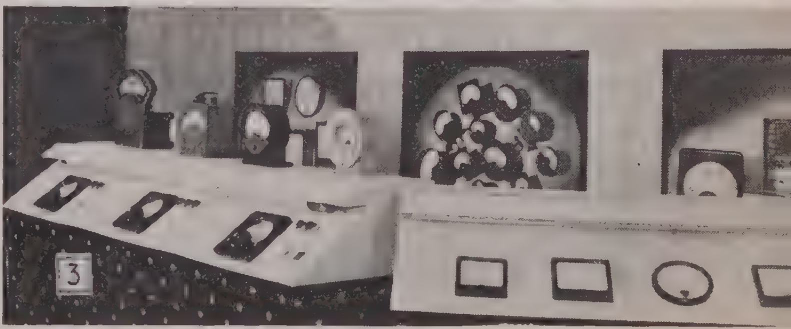
The digital data handling system shown by Armstrong Whitworth Equipment is constructed from plug-in logic elements and can transmit 15 digits plus one parity bit per channel at rates of over 100 channels per second. A transistorised tone telemetry system for transmitting up to 30 data channels over a telephone or radio link is being demonstrated by Elliott Brothers.

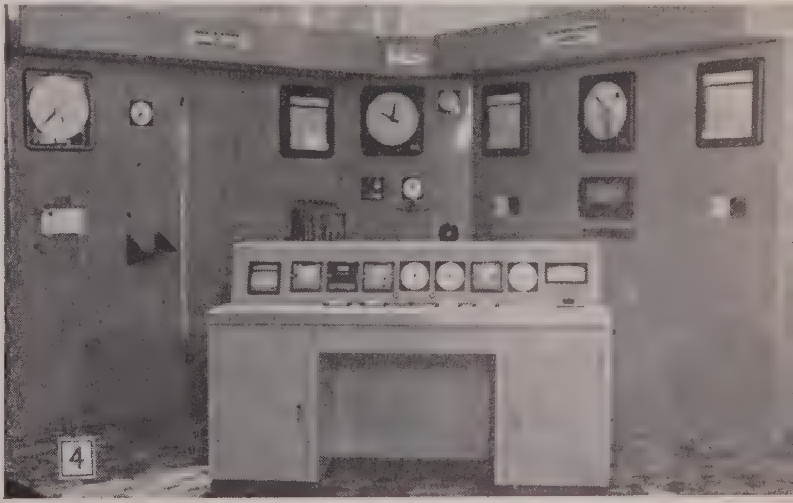
Many exhibitors display test equipment, including Martindale Electric, who are showing a phase and continuity indicator; the Clare Instrument Co. exhibiting loop testers of both the neutral/earth and phase/earth pattern, alone or combined with a 500 V battery-operated megohmmeter; and Tyer & Co. displaying a high-voltage cable fault tester.

Cables, Wiring and Trunking

Cables and associated equipment again form a large part of the exhibition. The cable division of A.E.I. (Woolwich) illustrates the 200 kV d.c. cross-Channel cable project, a venture shared with B.I.C.C. and certain







(1) The thermal overload relay display on the P. & B. Engineering Co., Ltd.'s stand. (2) A display of various Clifford & Snell relays exhibited by D. Robinson & Co., Ltd. (3) A selection of instruments on the Beckett & Parker stand. (4) Part of the stand of R. B. Pullin & Co., Ltd., and Measuring Instruments (Pullin), Ltd.

French concerns. Cables for railway service are prominently featured by Wandleside Cable Works, Ltd., including lead-coated "Corrusteel" armoured cables for connection to track control apparatus, point machines, impedance bonds and track circuit feeds.

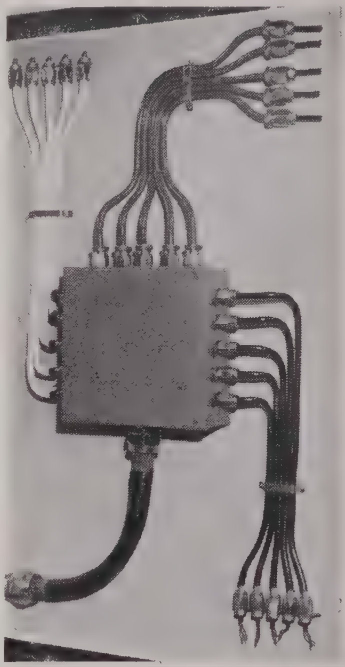
This year is the silver jubilee of Pyrotenax, Ltd., and their stand bears power and light-duty copper-covered cables up to 660 V, demonstrations of wiring using these cables and associated accessories, and a film strip of the manufacturing processes for mineral insulated cable. Irradiated polythene is used for the insulation of the "Merad" equipment wires shown by Mersey Cable Works, Ltd., while cables shown by Bakelite, Ltd., include some for high frequency use which incorporate cellular polyethylene insulation.

The exhibits on the British Insulated Callender's Cables, Ltd., stand range from 330 kV, single-core, oil-filled cable to new B.I.C.C.-Panelec mains voltage horticultural heating cables designed for direct burying in propagating beds. New Pirelli-General products on view include "Voltalit" resin components for high-voltage cable accessories, an oil-immersed termination for 33 kV, three-core, oil-filled cables and a straight joint for 33 kV, three-core solid or m.i.n.d. cable. A working model on the W. T. Glover stand demonstrates their method of impregnating non-draining paper insulant.

Many of the demonstrations to be seen at the exhibition concern cable jointing. A resin-filled cable joint for plastic insulated power cables is shown by Aerialite, Ltd., and jointing underground cable is demonstrated by the Bowthorpe Electric Co., who are also illustrating the applications of compression jointing in the mining industry. An improved version of the mechanical joint for power cables shown last year in prototype form by the Hepworth Iron Co. is displayed, also a new earth continuity connector or temporary bond for cable jointers' use.

Most of the firms exhibiting wiring accessories have new products on view. New Contactum accessories include 13 A twin switched socket-outlets and surface and flush clock connectors, while the Wandsworth Electrical Manufacturing Co. are showing new 13 A switch sockets and neon switch sockets to B.S. 2814 with metal plates and dollies. Recently introduced items on the M.K. Electric, Ltd., stand include a circular 13 A socket-outlet for B.S. 31 boxes. A new item shown by William McGeoch & Co. is an indicator light fitting for panels up to ½in thick.

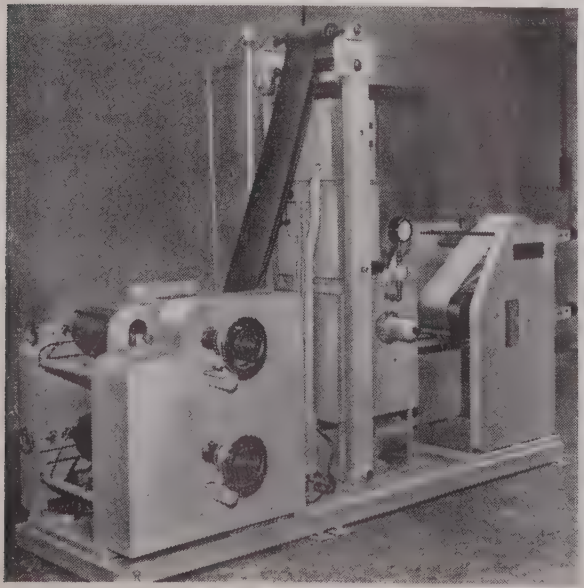
Increasing use is being made of plastic materials. Gilflex Conduits, Ltd., are showing newly-introduced plastic cable trunking for which a comprehensive range of fittings is available and the cover is attached without screws, while "Egatube" p.v.c. conduit and cable trunking in sizes from 3in by 3in to 12in by 6in can be seen on the Ega Electric, Ltd., stand. New plastic wire ducting is also being shown by Square "D," Ltd., and other firms showing exhibits in this category are F. C. Blackwell & Co. with their "Blacon" rigid p.v.c. tube conduit fittings and Nettle Accessories, Ltd., who have a range of plastic conduit boxes, connectors and joints.

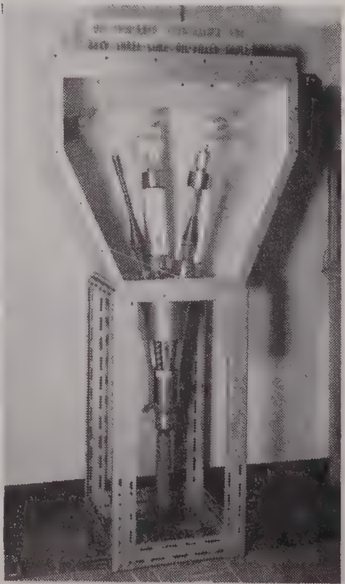


A selection of medium voltage h.b.c. fuse links exhibited by the EMP Electric Co., Ltd.

Heating Equipment

Industrial electrical heating equipment on view includes a new range of small capacity ovens produced by Hedin,

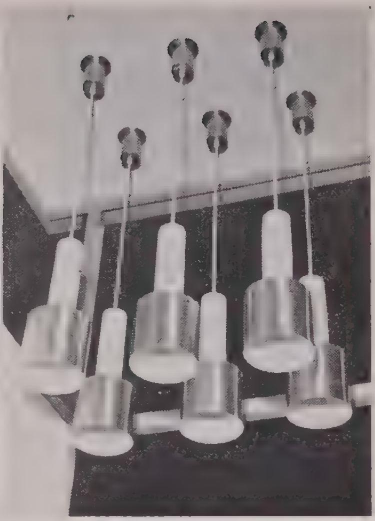




Left: W. T. Glover & Co., Ltd., are demonstrating their method of impregnating paper insulation for mains cables. Right: Oil immersed termination for 33 kV three-core oil-filled cable on the Pirelli-General Cable Works, Ltd., stand

Ltd. The process heating division of Pye, Ltd., is exhibiting a 3 kW induction heater designed for continuous operation. A water-cooled oscillator valve is incorporated and water is also used to cool the tank and work coils. A new development in the " Isotapes " range of electrical heating tapes on the Isopad, Ltd., stand is tape using metal-sheathed mineral insulated heating elements on a stainless steel mesh barrier for operating temperatures up to 650°C (1,200°F).

Industrial infra-red radiant heaters are prominent this year; two exhibitors showing such products are Dimplex, Ltd., with 750 and 1,500 W ceiling suspended models, and E. K. Cole, Ltd., who are showing new units which permit one-, two- or three-element/reflector assemblies to be used with a common spine. Interchangeable 1 kW or 1½ kW metal-sheathed elements are used, the maximum loading being 4½ kW.



Above : Some of the lighting fittings on the stand of Holophane, Ltd. Right: Pendant fittings for 100 W lamps displayed by C. M. Churchouse, Ltd.

The thermostat is the basic unit of most heating control systems and several new models are on show. The principal feature of the Rheostatic Co., Ltd.'s stand is the new " TM " room thermostat rated at 20 A a.c.; also shown on this stand is the new " Ratiomatic " automatic control system for electric underfloor heating, using a combination of inside and outside temperature detectors to regulate the charging period. A new three-step thermostat is being shown by Controlled Heating Units (London), Ltd.; while a frost protection thermostat for use in greenhouses and the " Proscontroller," a new inside/outside space heating controller, are among the new items displayed by Process Control Gear, Ltd. A 13 A, 250 V a.c. manually reset safety cut-out for overheat protection of fan and convector heaters, clothes dryers and other domestic equipment is shown by Otter Controls, Ltd., who also have a demonstration of contact pressure in which a thermostat is operating with a 1½ lb weight suspended from its moving contact.

Lighting

Several new fluorescent lighting fittings are to be seen. The " Netaline " fitting, shown by the A.E.I. Lamp & Lighting Co., is sold with a Mazda 4ft, 40 W warm-white lamp. Also shown is a new 24in diameter reflector fitting for use with a 1,000 W, MBF/U lamp and there is a demonstration of equipment designed to analyse the behaviour of lamp filaments under various vibration conditions. A new range of 4, 5 and 8ft single- and twin-tube fittings is shown by Atlas, and there is a demonstration of a new high-efficiency tube. Troughton & Young are showing two new ranges of fluorescent fittings, one including three fittings which are the first of a range using " Westinghouse " high-output lamps. The new 61 range on the H. W. Field & Son stand includes battens, reflectors and diffusers having a common panel and easy fixing facilities.

New Rowlands Electrical Accessories, Ltd., fittings include mushroom downward lighting floodlamps for illuminating flower beds and weatherproof trough lighting units for general garden illumination. Exterior lighting fittings are also shown by C. M. Churchouse in the form of wall lanterns. A new range of " Airflo " high-bay fittings, which accommodate mercury fluorescent lamps from 250 to 1,000 W, can be seen on the Simplex stand. This fitting has a self-cleaning spun aluminium reflector and glassfibre insulated canopy. A Holophane recessed 60 W bulkhead fitting for g.l.s. lamps is being shown for the first time and new fluorescent bulkhead fittings for one, two or three 8 W, 12in lamps by Revo Electric.

Some of the Victor Products weather- and flame-proof fittings are now available with " Circulume " chokes so that mercury-fluorescent lamps may be fitted without other alteration to the installation being necessary. Benjamin Electric have introduced re-styled " Coolicon " shades in 10 and 12in diameters covering all lamps up to 200 W. Harris & Sheldon are displaying a new range of pendants and wall brackets based on the Philips " Fantasie " lamps.

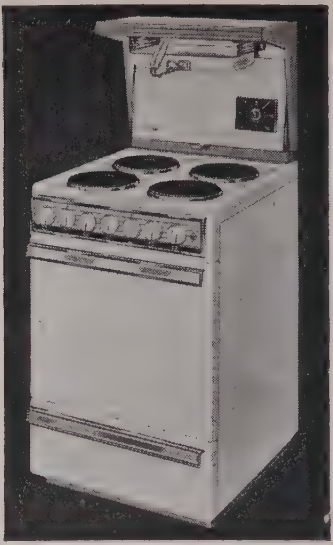
Several illuminated ceilings are to be seen. The recently introduced Junior " Briteglo " 6ft by 2ft floating ceiling, shown by Courtney, Pope, is illuminated by a single 5ft fluorescent fitting mounted over a suspended framework into which three translucent panels are dropped.

Colour-measuring apparatus is obviously of value to engineers concerned with illumination, and on the Tintometer stand several types of visual colour-measuring instruments are displayed together with a Lovibond Schofield tintometer which can be used for measuring the colour of signal lights, cathode-ray tube screens and other types of self-luminous bodies, and also for visual measurement of colour temperature of light sources and their colour-rendering properties.

Batteries and Chargers

One of the major battery exhibits is a replica of part of the high-voltage switchroom in a substation for the Kent Coast electrified lines of British Railways, forming part of the Pritchett & Gold and E.P.S. stand. The 100 V battery on a three-tier double-row stand incorporates high-performance cells in sealed glass boxes. Of interest on the Chloride Batteries stand is a new 1,000 Ah cell in a moulded glass box. Two 50 V batteries of this size have already been ordered by the G.P.O. A continuous duty 24 V " Safetylyte " emergency lighting equipment with a separate battery incorporating high-performance cells in sealed glass boxes is shown on the D.P. Battery stand connected to an emergency lighting circuit to demonstrate its operation.

Emphasis in the Catylators, Ltd., display is on the control of battery charging through a catalytic detector in accordance with the battery's gassing rate, which reflects the state of charge of the battery. A complete charging equipment using these principles is displayed, also a.c. and d.c. add-on units for converting existing equipment. Also to be seen on this stand is a new Harmer & Simmons transistor controlled " Cyclock " automatic float charger, which has a rapid response to load changes and gives very close regulation. A 136 V germanium and selenium battery charger with facilities for automatic change from the charge to float condition is shown by Troughton & Young, while Partridge, Wilson & Co. are exhibiting the latest " Davenset " automatic chargers employing silicon diodes.

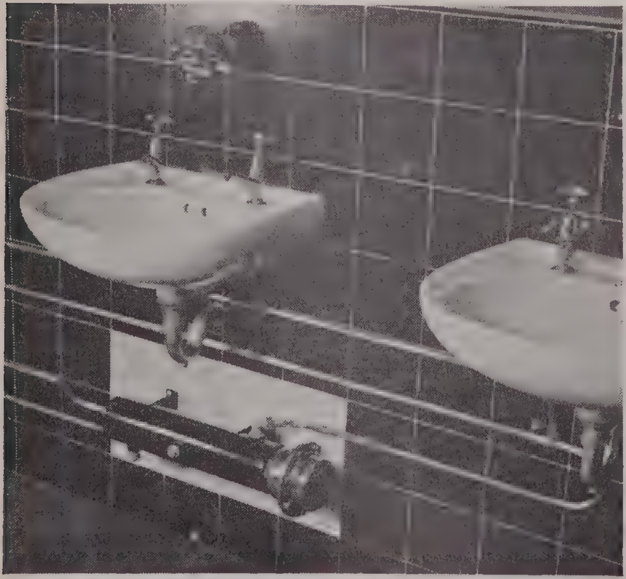


Jackson 494T "Highline" cooker shown by the Electrical Division of Radiation, Ltd.

Domestic Appliances

Practically all the domestic appliance manufacturers have included new products in their displays. Infra-red heaters are becoming increasingly used in the domestic field. There are three models of this type of heater in the new " Slim-Rad " range introduced by P. & R. Electrical. If required, these can be arranged to form a continuous strip radiator. Three new models in the " Jupiter " range of infra-red heaters, exhibited by Sofono, are the 1·5 kW versions of their adjustable wall-mounting heater and industrial chain-hanging heater and a 2 kW version of the portable free-standing heater. Thermodare are showing a new "WarmWave" series of domestic infra-red heaters available in 750 and 1,000 W versions, both intended for wall fixing and incorporating a double-pole 5 A pull switch.

New Magicook Appliances products include a 2 kW fan heater incorporating the " Air Rola Unit " giving three heat stages and two fan speeds, while the new Remploy fan heater has a wooden finish which is protected by a concealed metal shield. Red and blue lights indicate whether the heating elements are energised or the fan alone is running. Five new flame flicker coal or log effect fires, rated at 2 or 3 kW, are being displayed by Herman Smith Smithlite. The new " Two-Room " heater on one of the G.E.C. stands consists of a unit installed in a partition wall. Air is drawn through grills near the ceiling, heated under thermostatic control by a 4·5 kW element which can be switched to full heat or 1·5 kW for background warming, and expelled through vents at the base of the unit into either or both rooms. In warm weather the fan only can be used.



Santon type QX3 heater and spray tap system for school and staff ablutions

A new Crompton Parkinson product is the " Commodore " fluid-filled 1 kW radiator which has a maximum surface temperature of 170°F. Other oil-filled equipment on view includes a Hurseal panel radiator in curved form tailored to fit a semi-circular bay window.

Not all the heating exhibits are concerned with space heating. New " Dreamland " three-heat electric blankets, shown by Easipower Appliances, are rated at 80 and 130 W for the single- and double-bed sizes and have five-position illuminated switches. Demonstrated by Santon is a new type QX3 heater unit and spray tap system for school and staff ablutions. New " Swan Brand " kettles, shown by Bulpitt & Sons, include three- and four-pint models with electrical ratings of 2·75 and 3 kW respectively. A 700 W clockwork timed automatic turn-over toaster is being shown for the first time by Metway. A new cooker hotplate control, the " Panostat," on the A.E.I. Instrumentation Division stand, senses the temperature at the base of the pan and protects the pan and hotplate in the event of a pan boiling dry or when an empty utensil is placed on a " live " hotplate.

New refrigerators on view include the " Kitchencold," " Kitchencold Junior " and " Dinnercold Junior " units on the Tricity Cookers stand and also the " Astral " table-top model A350, which has a gross capacity of 3·5 cu ft, shown by Morphy-Richards.

Several firms show laundry equipment, including the recently introduced Hoover automatic " Keymatic " washing machine; the new Parnall wringer washer with reversible power wringer and automatic emptying pump shown by the Electrical Division of Radiation, Ltd.; while a new de-luxe model " Hi-Dry " telescopic clothes dryer and airer is displayed by L. G. Hawkins.

Lighting Fittings Makers' Luncheon

Left: Mr. D. L. Tabraham (president) responding to the toast of the Association; on his right are Messrs. W. J. Bird and F. J. Erroll and on his left the Master of the Tallow Chandlers' Company (Mr. P. Newnham) and Mr. T. S. Jones (the new president). Right: Mr. J. G. Christopher proposing the health of the guests

THE help which the Board of Trade offered to exporters was stressed by Mr. F. J. Erroll, Minister of State, Board of Trade, when he proposed the toast of " The Electric Light Fittings Association " at that body's annual luncheon on 15th March at the Tallow Chandlers' Hall, London, E.C.4. Mr. Erroll commended the Association upon its endeavours to encourage its members to improve their export trade and said that this was work in which the Association and the Board of Trade could help one another. The Board undertook only to provide information about markets and conditions; it was the business of the exporter to do the actual selling. It was most desirable for exporters to visit their markets. The Board of Trade's overseas representatives could smooth the path if they were informed in advance of proposed visits.

Mr. Erroll also mentioned the part played by the Board of Trade, in co-operation with exporters, in trade fairs, instancing the recent display at Cologne.

In replying to the toast, the president of the E.L.F.A., Mr. D. L. Tabraham, said that the Association had shown that it could quickly adapt itself to new conditions. Export trade was in the forefront of their newer activities; the industry's exports of 18 per cent of production compared favourably with those of foreign competitors. It also had to be remembered that there were considerable exports of ancillary equipment for use with their fittings. Although the Government could assist them it was only by each member " getting down to it " that the best results could be achieved. If they found it difficult to compete abroad they might soon find it difficult to compete at home. Last year imports of lighting fittings had a value of over £1 million—an increase of 17 per cent.

The Association wanted to see the regularisation of test specifications based on C.E.E. recommendations. Mr. Tabraham touched on the possibility of the establishment of a testing house in this country and said that the E.L.F.A. was doing much to promote good quality. They were still unable to assess accurately the extent of the home market, but it was clear that they would have to rely less on new building than on raising standards of lighting.

Mr. Tabraham concluded by thanking members for their support during his three years' presidency and he particularly mentioned the help given him by the director (Mr. J. H. Campion).

Mr. J. G. Christopher, in proposing the health of the guests, paid a compliment to Mr. Erroll for his work and enthusiasm; he was, of course, originally an electrical engineer. A reply was made by Mr. P. Newnham, Master of the Tallow Chandlers' Company, who gave an interesting brief account of the Company's 500-year history.

INDUSTRIAL ELECTRICITY

A LECTURE entitled " Electrical Installations for Large Industrial Projects," by Sir Henry Clay, was given at a meeting of the Association of Supervising Electrical Engineers in the Cromwell Hall at Earls Court last Wednesday. Sir Henry said that on large works distribution systems, correct selection of voltages and fault levels was important. High loads such as arc furnaces might need direct connection to high fault level and, therefore, high-voltage systems, while a voltage intermediate between 11,000 and 420 was often justified for larger motors.

The lecturer then referred to switchgear as a necessary evil which should be kept to the minimum and not be unduly complicated. Oil-filled gear had had a long innings and it was often the cheapest and was reliable, but breakers using air, or perhaps some less ionisable gas, should be as cheap and did not require such special housing.

All transformers which could be economically installed outside working areas should be oil-filled and have oil conservators. In the workshops, dry types of transformers with high-temperature insulation had many advantages.

The complexity of modern electrical equipment with its emphasis on " electronics " made plant maintenance both more difficult and more important and the standard of training and status of maintenance men had to be raised. Training and comprehension were also the best safety measures, although wisely drawn rules were also essential.

Financial Section

STOCKS and SHARES

WITH some encouragement from the latest overseas trade figures and from the evidence of improvement in the motor-car factories, the industrial markets of the Stock Exchange have again been seeing a considerable volume of business at prices around the highest levels ever recorded. Among the factors tending to keep the buyers in the ascendancy is the near prospect of amendments to the Trustee Act, whereby the powers of trustees are to be extended to cover investment in ordinary shares. The event is expected to accentuate at least to some extent an already marked shortage in the supply of popular industrials.

G.E.C. Prospects

Having risen by some 7s 6d, to 38s 9d, over the three previous weeks, the £1 shares of the General Electric Co. were reactionary at around 36s 3d after the issue of the formal offer for the capital of Radio & Allied Holdings. Market assessments of the position were apparently modified to some extent by the company's estimate that profits for the year ending this month will be significantly less than had been expected at the time of January's interim report. Then, the term "somewhat lower" had been used to indicate the difference between earnings in 1960–61 and those of the preceding twelve months. Nevertheless, the outlook is said to justify the board's intention to bring the total distribution for the latest year to 10 per cent, and to support its expectation of being able to maintain that rate on capital increased as a result of the merger. Benefits of the latter, and from other changes in the group's organisation, are likely, it is said, to be reflected in profits for 1961–62.

Firm Markets

The shares of English Electric and A.E.I. were also a little reactionary following their steep rises about the beginning of the month, but the recessions were a matter of pence only. The advance in C. A. Parsons was accelerated by news of the company's participation in the £33 million contracts for another new power station. At 57s 6d the shares were a further 3s 9d to the good, and there was a 2s improvement, to 35s 9d, in the shares of Babcock & Wilcox, the other company named in connection with the same project. Simon Engineering and some others in the heavy engineering sections also appreciated. Tube Investments rose 4s 6d to 84s 6d, and other useful gains were marked in Metal Industries at 64s 6d and Enfield Rolling Mills at 51s 6d.

Rising Prices

There was a revival of interest in the shares of Crabtree Electrical and

Price Changes in

Company or Board	Nom. Value	Middle price 20th Mar.	Week's Rise or Fall	Dividend Pre-vious	Dividend Last	Yield % £	s	d	1961 High-est	1961 Low-est
Gilt-edged Stocks						£	s	d		
Brit. Elec. 1968/73	100	74½		3	3	4	0	6	74¾	73¾
Brit. Elec. 1974/77	100	70		3	3	4	5	9	70¼	69½
Brit. Elec. 1976/79	100	73½		3½	3½	4	15	3	73½	71½
Brit. Elec. 1974/79	100	81	+½	4¼	4¼	5	5	0	82	80½
Brit. Elec. 1967/69	100	91		4½	4½	4	19	0	91½	89½
Overseas Electric Supply										
Calcutta Elec.	£1	21/-		7†	7½†	11	14	0	21/6	20/6
East African Power	£1	14/6	−6d	8	10	13	16	0	15/-	13/3
Nigerian Elec.	£1	18/-		.8	10	11	2	6	19/9	15/6
Perak Hydro-Elec.	£1	19/-		10	10	10	10	6	19/-	17/6
Electrical Shares										
Aberdare Holdings	5/-	15/3		17½	17½	5	14	9	15/6	14/3
Aerialite	1/-	7/6		54	54	7	4	3	7/6	6/9
Allen, W. H.	£1	38/-		14	10*‡	5	5	3	39/-	36/-
Allied Insulators	5/-	9/6	+3d	20	10*	5	5	3	9/6	8/9
Alwyn Holdings	5/-	25/-	−9d	—	12½	2	10	0	27/-	24/6
Anglo-Portuguese Tel.	£1	22/-		9	9	8	3	9	25/-	20/9
Arcolectric	1/-	5/-	+3d	15	15	3	0	0	5/3	3/9
Aron Meters	£1	68/-		15	15	4	8	3	68/-	67/6
Assoc. Elec. Ind. Ord.	£1	46/9x.d.	−6d	15	15	6	8	3	48/6	39/6
Automatic Tel. & El.	5/-	16/9		17	17	5	1	6	17/-	14/9
Babcock & Wilcox	£1	35/9	+2/-	13	9	5	0	9	35/9	30/3
Bakelite	10/-	51/3	−9d	17½	17½*	3	8	0	56/3	42/-
Baldwin, H. J.	2/-	1/6		20	—		—		1/6	1/6
Berry's Electric	5/-	47/9	+1/6	30	30*‡	3	2	9	47/9	37/-
Bowthorpe Holdings	2/-	9/-	+6d	27	18½*	4	2	3	9/-	8/-
Brit. Elec. Resistance	2/-	8/9	+9d	17½	17½*‡	4	0	0	8/9	6/6
Brit. Elec. Traction:										
Def. Ord. "A"	5/-	50/9	+6d	35	40	3	18	9	51/-	41/9
Brit. Electronic Ind.	5/-	13/9		—	15‡	5	9	0	14/9	12/3
B.I. Callender's	£1	58/-	+6d	13½	13½	4	13	0	58/-	49/6
B.I. Callender's 6% Pref. ...	£1	17/6		6	6	6	17	3	18/3	17/6
British Thermostat	5/-	38/-	−9d	35	20*	2	12	9	40/-	28/-
Brook Motors	10/-	49/6		25	25*	5	1	0	49/6	47/-
Bulgin, A. F.	1/-	10/3	+3d	55	40*	3	18	0	10/3	7/9
Bulpitts	5/-	18/-		15	16¼	4	10	3	18/-	16/9
Burco Dean	5/-	9/3		18	15	8	2	3	10/-	8/9
Cable & Wireless	5/-	21/3	+9d	10	10*		—		21/3	15/6
Cambridge Instruments ...	5/-	36/-	−3d	12½†	22	3	1	0	36/3	30/-
Chloride El. Storage "A" ...	£1	87/6	−2/6	20	17½*	4	0	0	88/-	72/-
Clarke Chapman	£1	48/9	+3/9	13¾	13¾	5	12	9	49/-	43/6
Combined Elec. Mfrs.	4/-	9/-	+6d	—	12½‡	5	11	0	9/-	7/6
Contactor Switchgear	5/-	15/6		14	14	4	10	3	16/-	14/6
Cossor, A. C.	5/-	6/9	−6d	5	Nil		—		8/-	6/6
Crabtree	10/-	32/6	+1/9	20	12½*	3	17	0	33/9	26/3
Crompton Parkinson	5/-	14/-		14	12½*	4	9	3	14/-	11/3
Davis & Timmins	5/-	35/3		20*	30‡	4	5	0	35/3	30/3
De La Rue	10/-	58/9	−4/3	22½	22½‡	3	16	6	64/6	55/-
Decca "A"	10/-	63/-	+1/-	20	23⅓	3	13	6	63/-	52/3
Desoutter	5/-	53/-		30	35	3	6	0	53/-	49/-
Dewhurst	2/-	9/9		20	20	4	2	0	9/9	7/6
Dictograph Tel.	2/-	12/-		20	20*	3	6	9	12/-	8/6
Dimplex	5/-	70/-	+2/6	—	30	1	15	9*	70/-	47/9
Dubilier Condenser	1/-	2/9		25	30	5	9	0*	2/9	2/3
Duport	5/-	15/3	+3d	17½	20	4	7	0*	15/3	12/6
E.M.I.	10/-	46/-		20	17½*	3	16	0	47/3	41/6
Eleco	2/-	7/3	+3d	20	20	2	15	3*	7/3	4/3
Electrical Apparatus	5/-	17/3		14½	20	5	16	0	17/9	17/-
Electrical Components	5/-	9/6		15	11½*	6	1	0	9/6	9/-
Elec. Construction	£1	35/6	+2/-	9	9	5	1	6	38/3	30/6
Elliott-Automation	5/-	28/9		9·3	12‡	2	1	9	29/-	25/6
Enfield Rolling Mills	£1	51/6	+3/6	15	15	5	16	6	51/6	46/3

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

Electric Construction, both of which have been subject to sporadic bouts of activity for some time past: the prices were advanced to 32s 6d and 35s 6d respectively. Dimplex broke all their previous remarkable records in reaching 70s shortly before the interim dividend declaration. Berry's Electric continued upwards with equal persistency to 47s 9d. Gains in Lucas, S. Smith and Chloride Electrical (with a dividend announcement imminent) reflected the better reports from the car industry, and among numerous other improvements during the past week attention was attracted to those in Engineering & Lighting Equipment Co., Combined Electrical Manufacturers, R. B. Pullin, Ultra Electric and Reliance-Clifton.

Electrical Investments

Company or Board	Nom. Value	Middle price 20th Mar.	Week's Rise or Fall	Dividend		Yield %			1961	
				Previous	Last				Highest	Lowest
Electrical Shares—continued						£	s	d		
English Electric	£1	40/-	−3d	10	10	5	0	0	40/9	32/-
English Electric 3¾% Pref. ...	£1	11/-		3¾	3¾	6	16	6	11/9	11/-
Ericsson Tel.	5/-	27/-x.d.		13†	13†	3	18	0	27/6	23/3
Ever Ready	5/-	34/6		27½	20*	2	18	0	34/9	31/6
Falk Stadelmann	£1	24/6	+6d	10	7½	6	2	6	24/6	21/9
G.E.C.	£1	36/3	−2/6	10	10	5	10	3	40/-	29/3
G.E.C. 6½% Pref.	£1	18/9	+6d	6½	6½	6	18	9	19/3	18/3
General Cables	5/-	6/3		15	Nil		—		6/3	3/9
Goblin (B.V.C.)	5/-	7/6	−9d	12½	10	6	13	3	8/6	6/-
Hackbridge Holdings	5/-	6/9		20	20	7	8	3*	6/9	5/-
Harland Engineering	5/-	18/-		14	16*	4	9	0	18/6	15/6
Head Wrightson	5/-	23/9		20	14*	2	19	0	23/9	22/-
Heatrae	2/-	12/6	−9d	20	22½	3	12	0	14/-	12/6
Holophane	5/-	19/-	+3d	26	30	7	18	0	19/-	17/3
Hoover	5/-	50/-		90	45*	4	10	0	50/-	46/-
Hunt, A. H.	4/-	23/9		20	20	3	7	3	25/9	18/-
Intl. Combustion	5/-	30/6		30	30	4	18	3	30/6	24/-
Intl. Computers & T.	£1	86/3	+1/3	10	11¼	2	12	3	86/3	59/-
Johnson & Phillips	£1	22/9		5	Nil		—		22/9	17/6
Kenwood Mfg.	1/-	5/9	+3d	—	—		—		6/-	5/3
Laurence Scott	5/-	17/3		15	15*	4	7	0	17/9	15/3
Lister, R. A.	£1	54/-		14	14	5	3	9	54/-	47/3
Lucas, J.	£1	65/-	+6d	12½	13¾	4	4	6	65/-	62/-
Marryat & Scott	2/-	16/-	+6d	22½	27½	3	8	9	16/-	13/9
Mather & Platt	£1	46/3	−6d	11	11	4	15	3	51/6	41/6
Metal Industries	£1	64/6	+1/-	14	15	4	13	0	64/6	53/-
Midland Elec. Mfg.	£1	60/-		12	12	4	0	0	60/3	58/6
Murex	£1	44/-		15	20	5	4	0*	44/-	39/3
Newman Ind.	2/-	5/9		12½	12½	4	7	0	5/9	5/-
Oldham & Son	1/-	2/9		17½	17½*‡	6	7	3	3/-	2/3
Parsons, C. A.	£1	57/6	+3/9	8½	9⅜	3	5	0	57/6	46/9
Philips' Lamps	Fl.10	250/-		16	16*	1	5	9	£12½	£10½
Plessey	10/-	52/6	−6d	15½‡	17‡	3	4	9	53/-	46/6
Pullin, R. B.	2/-	12/9	+9d	25	25	3	18	6	13/3	11/3
Pyrotenax	5/-	53/6		34	40	3	14	9	53/6	46/6
Radiation	£1	34/-	−6d	6	12	7	1	3	35/3	31/6
Reliance-Clifton	5/-	26/-	+9d	15	15	2	17	9	26/-	22/6
Reyrolle	£1	45/-		17½	17½	3	17	9*	45/-	36/6
Richardsons Westgarth	10/-	6/6		8⅓	8⅓		—		7/-	6/6
Sangamo Weston	10/-	28/3	+3d	12½	11*	3	18	0	28/3	26/3
Scott, James	5/-	25/9		24	25*	4	17	0	27/9	25/6
Simon Engineering	5/-	38/-	+1/-	—	26·6‡	3	10	3	38/-	28/-
Smith (England), S.	4/-	20/3	+6d	17½	20	3	19	0	20/3	17/-
Southern Areas	£1	18/-	+6d	Nil	5	5	11	0	18/-	14/6
Strand Elec.	5/-	16/6		20	14·6*	4	8	3	17/-	12/3
Sturtevant	5/-	15/6		15†	15†	7	19	0	18/6	13/9
Sun Elec.	5/-	17/3		15	18½	5	7	3	17/6	17/-
T.C.C.	10/-	41/-		35	22½*	5	9	9	41/-	40/-
Telephone Rentals	5/-	26/-	+3d	12½	15*	2	17	9	26/-	21/9
Thompson (John)	5/-	16/6	+9d	25	20	6	1	3	16/9	14/-
Thorn Elec.	5/-	57/6		20	25	2	3	6	57/6	44/6
Thornycroft	£1	30/-		6	6	4	0	0	34/9	25/9
Tube Investments...	£1	84/6	+4/6	—	14	3	6	3	84/6	72/6
Ultra Electric	5/-	22/-	+1/9	20	25	5	13	9	22/6	12/6
Walsall Conduits	4/-	12/3		22½	15*	4	18	0	12/3	10/9
Ward & Goldstone	5/-	30/6	+1/6	30	35	2	17	6*	30/6	25/6
Watford	2/-	10/-	−6d	25	25	4	0	0*	10/9	8/9
Westinghouse	£1	40/6		11	11	5	8	6	42/-	36/-
West, Allen	5/-	14/3	−3d	12½	12½*	4	7	9	14/6	11/6
Wilkins & Mitchell	5/-	13/9		17	21*		—		15/3	11/9
Wolf Electric	5/-	16/3		10	12½	3	17	0	16/3	14/-

Dividends Declared

For the seventh year in succession A. F. Bulgin announce an increase in the ordinary dividend. A payment of 40 per cent for 1960–61 represents an improvement (allowing for an intervening scrip issue) of about 3½ per cent on the previous rate, and is comfortably accommodated by a further modest improvement in profits. The 4s shares advanced to 10s 3d and the yield goes up to nearly 4 per cent. An initial decline to 17s in the 5s shares of Bulpitts (Swan Brand) marked some disappointment with the declaration of a final dividend making an unchanged total of 16¼ per cent for the past year, and the announcement of profits slightly down on the previous figures, but the price quickly recovered to 18s.

Philips' Lamps Progress

Investment interest in the European market grows steadily, and the shares of the Netherlands enterprise of Philips' Lamps are among the most widely held of their kind in this country. Their popularity is limited by a quotation as heavy as £12½ per share, and a yield of under 1½ per cent on the present rate of dividend restricts their appeal to the investor interested less in present income than in long-term growth. From the latter point of view, however, the record over recent years may fairly be described as dramatic, and the latest annual report gives firm support to hopes of continued expansion, even if at a somewhat slower pace.

Ericsson Results

At 27s, ex-dividend, the 5s shares of Ericsson Telephones have retained most of the rise induced by the big increase in profits reported for 1960 and the directors' confident assessment of this year's prospects. An expansion of more than 50 per cent in the trading profit, to just over the million mark, fully restored the previous year's contraction, and covers more than 1½ times the 13 per cent net rate of dividend which has now been paid for three years in succession. The state of the order book is described in the annual report as very satisfactory and likely to remain so throughout the current year.

REPORTS and DIVIDENDS

G.E.C.'s Lower Profit.—With the formal offer for the capital of Radio & Allied (Holdings), Ltd., by the General Electric Co., Ltd., it is stated that G.E.C.'s profit for the year to 31st March, 1961, will be "significantly less" than expected at the time of the interim dividend, when indications were that they would be "somewhat lower" than for 1959-60.

Nevertheless, the board feels that the outlook justifies its announced intention to pay a second interim of 7 per cent to make 10 per cent for 1960-61 and it expects to maintain 10 per cent on the capital as increased by the offer.

Bruce Peebles & Co., Ltd., suffered a severe set-back during 1960. A net loss of £149,658 was incurred, and no ordinary dividend is being paid. For 1959 a single dividend of 10 per cent was paid and a net profit of £46,896 was earned.

The passing of the ordinary dividend was foreshadowed by the board last December, when they said that delays which had occurred would seriously affect results for the current year. They stated, however, that they had every confidence in the company's future, with the order book position satisfactory and the rate of order intake encouraging.

Bulpitts (Swan Brand), Ltd.—The final dividend is 11¼ per cent, making 16¼ per cent for 1960 (same). Group profit is £729,579 (£758,971), including surplus on sales of investments £103,866 (£53,561), but before tax £315,955 (£349,692). Credited tax provisions no longer required amount to £10,511 (£24,142). Amount attributable to Bulpitts (Swan Brand) is £424,135 (£433,421).

G. & J. Weir Holdings, Ltd., who already own 50 per cent of the capital of Weir-Catton, Ltd., announce that they have made arrangements to acquire the remaining shares of that company. Weir-Catton, Ltd., is a holding company with two operating subsidiaries, Catton & Co., Ltd., and Weir Foundries, Ltd., both of Leeds, who manufacture quality castings in carbon, low alloy and stainless steels for a wide range of industrial applications.

Pifco Holdings, Ltd., have declared an interim dividend of 12½ per cent (the same).

Staveley Coal & Iron Co., Ltd.—At a special meeting of stockholders it was agreed that the company's name should be changed to Staveley Industries, Ltd., as recommended by the board. The 27 companies in the Staveley group include W. H. Smith & Co. (Electrical Engineers), Ltd., of Manchester.

Wolf Electric Tools (Holdings), Ltd., is increasing its dividend from 12½ per cent to 13¾ per cent for 1960 and proposes to make a one-for-eight "rights" issue. Group profits increased from £277,326 to £308,181, subject to tax of £148,419 against £140,000.

New Companies

Plastic Insulated Cables (Sales), Ltd.—Registered 8th March. Capital £100. Manufacturers of and dealers in insulated cables and wires, etc. Directors: J. Connelly, Boundary House, East Preston, and N. F. Badley, 58, Syke Cluan, Iver, Bucks. Secretary: B. G. Titchener.

D. W. Young (Electrical), Ltd.—Registered 15th February. Capital £100. Electricians, mechanical, radio and general engineers, etc. Directors: D. W. Young and Mrs. Violet D. Young. Secretary: J. A. Wood. Regd. office: 104a, Hermitage Road, St. Johns, Woking, Surrey.

Fan Manufacturing Co., Ltd.—Registered 15th February. Capital £5,100. Manufacturers of and dealers in fan impellers, etc. Directors: H. E. Hazel, J. M. Sumner, R. V. Rutterford and H. E. Rutterford. Secretary: E. J. Agates. Regd. office: Charterhouse, E.C.1.

Contarini Development Co., Ltd.—Registered 16th February. Capital £100. Electronic and automation engineers, etc. Directors: L. Legge and Winifred M. E. Legge (secretary). Regd. office: Palace House, Beaulieu, Hants.

Delontar, Ltd.—Registered 16th February. Capital £100. Electrical engineers, etc. Secretary: L. R. Battell, 117, Hart Road, Thundersley, Essex.

I.G.A. (Electronics), Ltd.—Registered 16th February. Capital £1,000. Coil winding for electrical and electronic apparatus, etc. Directors: R. H. Brett and Elizabeth J. Brett. Secretary: G. G. Rudd. Regd. office: 48, Station Road, Harrow.

B. C. Hones, Ltd.—Registered 16th February. Capital £100. Manufacturers of and dealers in general electrical and other equipment, etc. Directors: B. C. Hones and Mrs. Vera J. Hones (secretary). Regd. office: 245a, Broadway, Bexleyheath, Kent.

B. & H. Electrical Engineers (Ferndown), Ltd.—Registered 21st February. Capital £500. Directors: D. R. Burroughs, Daphne E. Burroughs, D. A. Harris and Marion O. Harris (secretary). Regd. office: 11, Hadrians Close, Ferndown.

Blakes (Dartford), Ltd.—Registered 7th February. Capital £100. Electrical and mechanical engineers and contractors, etc. Directors: K. W. Blake and Mrs. Elizabeth B. Blake (secretary). Regd. office: 9, Marcus Road, Dartford, Kent.

Cedco (Overseas), Ltd.—Registered 21st February. Capital £100. Importers, exporters, distributors, manufacturers of and dealers in electronic instruments, etc. Directors: G. J. Claremont, E. Benjamin, C. Z. Berger, W. Bond and S. W. Hutton. Secretary: E. T. P. Cooper. Regd. office: 57, Blandford Street, W.1.

Cunliffe & Hartley, Ltd.—Registered 21st February. Capital £1,000. Electrical engineers, general electrical and refrigeration contractors, manufacturers and repairers of and dealers in radio and television sets, etc. Directors: A. Cunniff and W. Hartley. Secretary: W. Chamberlain. Regd. office: 134, Deane Road, Bolton, Lancs.

Vidaire Electronics, Ltd.—Registered 21st February Capital £100. Secretary: A. M. Brenner. Regd. office: 8, Southampton Row, W.C.1.

Woodgate Electrical Co., Ltd.—Registered 21st February. Capital £1,000. Directors: E. Woodgate, E. C. Woodgate (secretary), Florence L. Woodgate and J. Coombs. Regd. office: 31, Hanworth Road, Feltham, Middx.

A. Davies & Son (Electrical Engineers), Ltd.—Registered 21st February. Capital £1,000. Directors: S. Davies, "Marton," Wilmslow Road, Woodford, Ches., and K. Davies (secretary), 20, Tideswell Road, Hazel Grove, Stockport.

Bates & Graver, Ltd.—Registered 23rd February. Capital £700. Electrical engineers, general electrical and refrigeration contractors, manufacturers and repairers of and dealers in radio and television sets, etc. Directors: J. E. Bates (managing director), A. M. Graver, Mrs. Pauline S. Bates (secretary) and Mrs. Moira Gracer. Regd. office: 467, Newark Road, North Hykeham, Lincoln.

G. Stephen & Co., Ltd.—Registered 24th February. Capital £5,000. Electrical engineers and general electrical installation contractors, lighting specialists, and manufacturers, repairers of and dealers in electrical plant, radio and television sets, etc. Directors: G. A. Stephen and Mrs. Barbara Stephen (secretary). Regd. office: 14, Oxford Street, Newcastle-upon-Tyne, 1.

Trafalgar Electrical Co., Ltd.—Registered 27th February. Capital £1,000. Electrical engineers, etc. Directors: Margaret L. Geary (secretary) and K. Clancy. Regd. office: 127, Queen Victoria Street, E.C.4.

Tingley's Electrical (Brighton), Ltd.—Registered 23rd February. Capital £3,000. Manufacturers of and dealers in radio and television sets, etc. Directors: L. C. Surman, Irene G. Surman and Annie J. Killick (secretary). Regd. office: 57, Lewes Road, Brighton, 7.

Simms Electrical, Ltd.—Registered 23rd February. Capital £100. Designers, manufacturers, repairers and servicers of and dealers in electrical and electronic equipment, apparatus and appliances, etc. Solicitors: Slaughter & May, 18, Austin Friars, E.C.2.

Hawkey, Jenden & Co., Ltd.—Registered 23rd February. Capital £3,000. Electrical engineers, general electrical and refrigeration contractors, etc. Directors: G. L. Fordy, G. M. Fordy (secretary), D. Hawkey and B. Jenden. Regd. office: 137, Durham Road, Stockton-on-Tees.

William Dalton & Son (Electricians), Ltd.—Registered 24th February. Capital £5,000. Directors: D. Dalton (chairman and managing director), G. Dalton and C. Walker. Secretary: A. Melrose. Regd. office: 82, Conran Street, Harpurhey, Manchester, 9.

R. & L. Electrical Services, Ltd.—Registered 24th February. Capital £100. Directors: N. Richardson and G. Lawley. Secretary: Betty I. Lawley. Regd. office: 104, Field Lane, High Heath, Pelsall, Staffs.

Newmark Instruments, Ltd.—Registered 7th March. Capital £100. Manufacturers of and dealers in scientific, technical, audio, optical and photographic apparatus, instruments and appliances, etc. Directors: H. H. Newmark, G. L. Newmark, D. D. Rothschild and H. A. Lewis. Regd. office: 143/9, Great Portland Street, W.1.

D. G. Davies (Electrical), Ltd.—Registered 7th March. Capital £100. Directors: Wyn Davies, Dorothy G. Davies and Elizabeth M. Davies. Regd. office, 14, Lucas Road, Glais, Clydach, near Swansea.

Central Refrigeration & Heating Engineers, Ltd.—Registered 7th March. Capital £1,000. Directors: P. F. Burgess and J. W. E. Woodward (secretary). Regd. office: 68a, Sycamore Road, Handsworth, Birmingham, 21.

J. H. Gibbons & Co., Ltd.—Registered 7th March. Capital £100. Electricians, workers, hirers, servicers and maintainers of electrical and electronic apparatus, etc. Directors: J. H. Gibbons (secretary) and Mrs. Doreen A. Gibbons. Regd. office: 12, Bow Lane, Cannon Street, E.C.4.

Bowers Electromation Engineering, Ltd.—Registered 7th March. Capital £100. Electronic and automation engineers, etc. Directors: R. R. Bowers (secretary) and Doris G. Bowers. Regd. office: 209a, Hertford Road, N.9.

E. Finch & Son (Electrical), Ltd.—Registered 7th March. Capital £1,000. Directors: E. R. G. Finch, Violet A. Finch (secretary) and D. J. Finch. Regd. office: 7, Warmdene Road, Patcham, Brighton, 6.

J. F. Millward (Liverpool), Ltd.—Registered 7th March. Capital £2,000. Manufacturers of and dealers in electrical equipment, etc. Secretary: Dorothy M. Graeme, 61, Fairview Avenue, Gillingham, Kent.

Lewis & Clarke (Electrical), Ltd.—Registered 7th March. Capital £100. Electricians, electrical contractors, etc. Directors: P. I. Lewis, N. A. Clarke and R. Culbert. Secretary: W. G. Trott. Regd. office: 99/101, High Street, Berkhamsted.

Centralex, Ltd.—Registered 28th February. Capital £500. Electricians, mechanical engineers and manufacturers and workers of and dealers in electrical apparatus and goods, etc. Directors: L. M. Scott-Chambers, L. S. Brown and K. J. Adney (secretary). Regd. office: 283, Green Lanes, Palmers Green, N.13.

Pleass & Hacker, Ltd.—Registered 1st March. Capital £2,000. To acquire the business of electrical engineers carried on by E. P. W. Pleass and R. W. Hacker at Bristol, etc. Directors: E. P. W. Pleass, Gladys L. Pleass (secretary), R. W. Hacker and Peggy V. Hacker. Regd. office: Langport Works, Lower Cheltenham Place, Bristol, 6.

Rix Bros., Ltd.—Registered 6th March. Capital £2,000. To acquire the business of electrical engineers carried on by L. D. and Gladys H. Rix at Cliftonville, etc. Directors: L. D. Rix, Gladys H. Rix and J. W. Green (secretary). Regd. office: 4, Wilderness Hill, Cliftonville, Margate.

L. E. Contrax, Ltd.—Registered 6th March. Capital £100. Electrical engineers and contractors, etc. Directors: B. H. Welsman and B. W. Owen (secretary). Regd. office: 88/92, Rochester Row, S.W.1.

C. H. Parsley, Ltd.—Registered 3rd March. Capital £1,000. Electrical engineers, etc. Directors: C. H. Parsley and T. H. Ball. Secretary: T. A. Herbert. Regd. office: 95a, Chancery Lane, W.C.2.

Platt & Sloan Enterprises, Ltd.—Registered 3rd March. Capital £1,000. Manufacturers of and dealers in electrical equipment. Directors: A. Sloan and F. E. Platt. Secretary: C. F. Cooper. Regd. office: 6, Cross Street, Preston, Lancs.

Wm. Evans (Electrical), Ltd.—Registered 3rd March. Capital £1,000. Electrical engineers and general electrical installation contractors, etc. Directors: W. Evans and K. V. Evans. Secretary: R. Evans. Regd. office: 117, Golden Avenue, Cardiff.

Eastman Electric, Ltd.—Registered 2nd March. Capital £100. Manufacturers of and dealers in vacuum cleaners, sewing machines, etc. Directors: W. J. Eastman (secretary) and Mrs. Joan K. Eastman. Regd. office: 177, Percy Road, Hampton, Middx.

Derek Thomas, Ltd.—Registered 3rd March. Capital £100. Manufacturers, designers, consultants, hirers, renters, repairers, exporters, importers of and dealers in electrical equipment, apparatus, machinery, etc. Directors: D. Thomas and Mrs. Hilda G. Thomas (secretary). Regd. office: 3, Cowper Street, Middleton Junction, Lancs.

Hammant & Morgan, Ltd.—Registered 3rd March. Capital £30,000. To acquire the business of electrical and mechanical engineers carried on by F. A. Hammant and A. Morgan at Wealdstone, Middlesex, as Hammant & Morgan, etc. Directors: F. A. Hammant and A. Morgan (secretary). Regd. office: Handem House, 39, Masons Avenue, Wealdstone, Middlesex.

Stenmec Products, Ltd.—Registered 3rd March. Capital £30,000. Manufacturers of steel electric cable channelling and trunking, etc. Directors: H. Willetts and Lilian D. A. Willetts. Secretary: D. Willetts. Regd. office: Engine Lane, Lye, Stourbridge.

Electrical Rewinding Services (York), Ltd.—Registered 1st March. Capital £2,000. To acquire the electrical rewinding section of the business carried on by York Autolectrics, Ltd., etc. Directors: C. T. Marks and W. C. Bower. Regd. office: 2a, Lead Mill Lane, Piccadilly, York.

J.S. Electrical Installations (North Cray), Ltd.—Registered 1st March. Capital £1,000. Directors: J. E. Layzell, Sylvia M. H. Layzell (secretary) and Ira E. Layzell. Regd. office: 8, Station Road, Sidcup, Kent.

Receivers Appointed

R. Brock, Ltd., 135, Brockhurst Road, Gosport.—Mr. K. J. Riley, 10, West Street, Fareham, was appointed receiver and manager on 11th February, 1961, under powers contained in a charge dated 15th October, 1959.

Walter Instruments, Ltd., Garth Road, Morden, Surrey.—Mr. C. E. M. Emmerson, of 28, King Street, E.C.2, was appointed receiver and manager on 15th February, 1961, under powers contained in debenture dated 21st January, 1942.

Winding-up Petition

Longford Electric Co., Ltd.—A petition has been presented for the winding up of the company and is to be heard in the High Court on 27th March.

Liquidations

Alan Breck, Ltd., electrical appliance retailers, 25, New Station Street, Leeds.—Liquidators, Mr. R. W. Hellyer, Brotherton Chambers, Westgate, Leeds, and Mr. J. A. Shires, 24, Basinghall Street, Leeds, appointed by members and creditors on 8th March. Particulars of claims to Mr. R. W. Hellyer, by 15th April.

W. Doubleday, Ltd., radio, television and electrical dealers, Glenisla, Kirklington, Bedale, Yorks.—Liquidator, Mr. R. W. Hellyer, Brotherton Chambers, Westgate, Leeds, appointed by creditors on 27th February. Particulars of claims to the liquidator by 10th April.

Ilmace, Ltd., electrical wholesalers, 5, Mead Road, Dartford, Kent.—Winding up voluntarily. Liquidator, Mr. A. E. Pritchard-Fellows, 45, Upton Road, Bexleyheath, Kent, appointed by members and creditors on 9th February.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to the dates stated:—

8th April

In-sink-erator. No. 810,488. Class 7. Electrically operated garbage disposal machines.—In-sink-erator Manufacturing Co., Wisconsin, U.S.A. Address for service: Stevens, Langner, Parry & Rollinson, 5-9, Quality Court, Chancery Lane, London, W.C.2.

Mercury. No. 792, 766. Class 9. Electric flat irons.—Revo Electric Co., Ltd., Britannia Works, Groveland Road, Tividale, Tipton, Staffs.

Bambi Charger. No. 797,575. Class 9. Electric battery chargers for fitting to motor vehicles.—Amos of Exeter, Ltd., Weircliffe Court, Exwick, Exeter.

Ambuco. No. 800,492. Class 9. Electrical apparatus for the separation, precipitation and treatment, etc., of industrial dusts and liquids from air and industrial gases, using the principle of electrostatic precipitation; and electrical apparatus for the cleaning, purifying, heating and cooling of air and industrial gases. —Ambuco, Ltd., 2-5, Old Bond Street, London, W.1.

Aster. No. 801,567. Class 9. Electrical appliances (parts of electrical wiring installations for use in the control of electrical discharge apparatus). No. 801,568. Class 10. Electric lamps for medical purposes. **Panelume.** No. 805,607. Class 10. Electric lamps and lighting fittings.—Thorn Electrical Industries, Ltd., Thorn House, Upper St. Martin's Lane, London, W.C.2.

Ericrossbar. No. 805,312. Class 9. Automatic telephone exchanges incorporating cross-bar switches. — Telefonaktiebolaget L. M. Ericsson, Stockholm, Sweden. Address for service: Haseltine, Lake & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

Eltamatic. No. 805,998. Class 9. Switchgear.—Cathodeon Electronic, Ltd., Bircham Road, Southend-on-Sea.

Arom Cortacir. No. 806,824. Class 9. Electric switches.—J. M. Riera, Gibraleon (Huelva), Spain. Address for service: Arthur R. Davies, Royal Chambers, Promenade, Cheltenham.

Feutron (design with circle). No. 808,462. Class 9. Instruments for measuring, recording and controlling the humidity, temperature and pressure of gases and matter; electrical testing apparatus; and electrical apparatus for use in the automatic control of machinery in accordance with a predetermined programme. —Veb Intron Leipzig, Holzhauser Strasse, Leipzig, Germany. Address for service: Matthews, Haddan & Co., 31-32, Bedford Street, Strand, London, W.C.2.

Platinel. No. B809,053. Class 9. Thermocouples and wire for use in their manufacture.—Engelhard Industries, Inc., New Jersey, U.S.A. Address for service: Haseltine, Lake & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

Inté-Rapid. No. 809,922. Class 9. Electrical, electronic and scientific apparatus and instruments.—Interapid S.A., Rolle Vaud, Switzerland. Address for service: Raworth, Moss & Cook, 38, Sydenham Road, Croydon.

15th April

Galaxy. No. 808,948. Class 7. Electrical machines for domestic use. No. 808,949. Class 9. Electrical, radio and television apparatus. No. 808,950. Class 11. Installations for lighting, heating, steam generating, cooking, refrigerating, drying and ventilating purposes.—A.E.I.-Hotpoint, Ltd., 33, Grosvenor Place, London, S.W.1.

Director. No. 812,438. Class 7. Washing machines. No. 812,440. Class 9. Vacuum cleaners and electrical apparatus incorporating an alarm clock for use in making beverages at a predetermined time. No. 812,442. Class 11. Space heating appliances. **Herald.** No. 812,441. Class 11. Space heating appliances. —Goblin (B.V.C.), Ltd., Goblin Works, Ermyn Way, Leatherhead, Surrey.

Atlantis. No. 789,528. Class 9. Cathode ray tubes and parts of television apparatus.—Electronic Products (Cardiff), Ltd., 47, Westgate Street, Cardiff.

Laiss. No. 804,639. Class 9. Scientific, electrical and electronic apparatus and instruments.—Decca Navigator Co., Ltd., 9, Albert Embankment, London, S.E.11.

Jason. No. B804,691. Class 9. Scientific and electrical apparatus.—Hawker Siddeley Nuclear Power Co., Ltd., Sutton Lane, Langley, near Slough, Bucks.

Trinistat. No. 808,628. Class 9. Self-regulating electric power supply units for use in supplying d.c. or a.c. loads from supply circuits.—Westinghouse Brake & Signal Co., Ltd., 82, York Way, King's Cross, London, N.1.

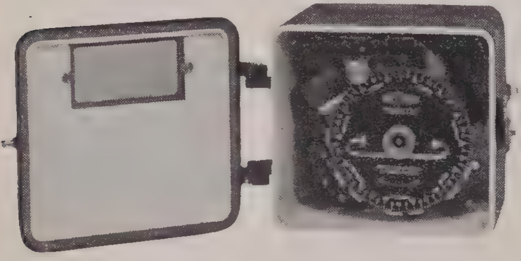
Albatross. No. 811,643. Class 11. Portable electric fires.—Taylor & Wilson, Ltd., Taywil Works, Blackburn Road, Clayton-le-Moors, Accrington, Lancs.

NEW ELECTRICAL EQUIPMENT

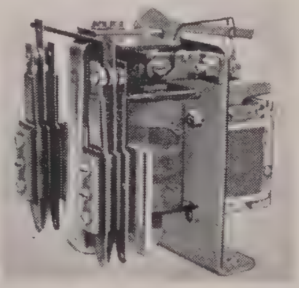
SEVEN-DAY TIME SWITCH

The "Timestat" model "B" time switch has been designed by the Horstmann Gear Co., Ltd., Newbridge Works, Bath, to control irregular and complex switching schedules for space heating plant.

The unit consists of a movement making one revolution in seven days. The exact switching requirements for each day can be individually programmed. The large diameter dial is engraved with days and hours and the operating tappets consist of cam segments which are built up to provide a continuous cam form for the switching schedule required. These segments are held by clamps secured by knurled nuts on the rear of the dial. The operations for each day are clamped independently. An overriding on and off manual control is fitted, independent of dial operation, the sequence remaining unchanged for the return to automatic control when desired. The unit is available with either synchronous or electrically wound clockwork movements or with synchronous movements with spring reserve. Two models are available with contacts rated at 5 A 250 V a.c. and 20 A 250 V a.c.



(Above) Horstmann "Timestat" time switch



(Right) ElRemCo electrically re-set latching relay

LATCHING RELAY

The latching relay type UNIV/LA produced by the Electrical Remote Control Co., Ltd., Bush Fair, Tye Green, Harlow New Town, Essex, can carry up to eight contact sets, normally open, normally closed, changeover or mixed. It is held by a latching mechanism in the energised position after a short pulse is applied to the coil. When the lever attached to the relay is pressed the contacts are released to the de-energised position and remain there until a further pulse is applied to the coil.

The range of coils available covers up to 440 V a.c. or 230 V d.c. The consumption rating depends upon the number of contacts to be operated up to a maximum continuous rating of 12 VA, or intermittent up to 18 VA. The contact rating is 6 A at 30 V or 2 A at 440 V a.c. or 1 A at 240 V d.c. with non-inductive loads. An alternative version is available which can be both latched and unlatched by electrical impulse. This has an additional release coil wound for 110, 200/250, or 400/440 V 50 c/s operation, and having a consumption from 6 to 10 VA.

SAG CALCULATOR

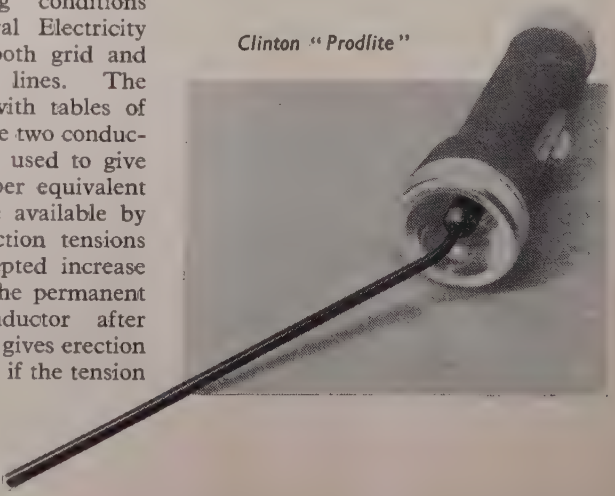
A calculator has been designed by Riley & Neate, Ltd., Abbey Mill, Winchester, Hants, for working out sags for 0·4 and 0·175 sq in copper equivalent s.c.a. conductors; it is based on the latest loading conditions specified by the Central Electricity Generating Board for both grid and supergrid transmission lines. The calculator is provided with tables of erection tensions for these two conductors, but it may also be used to give sags for 0·07 sq in copper equivalent s.c.a. if the tensions are available by other means. The erection tensions quoted include the accepted increase in tension to allow for the permanent extension of the conductor after erection. The calculator gives erection sags direct, and final sags if the tension is first reduced to the final figure as indicated.

The tension tables were obtained by calculating a sufficient number of values accurately and then interpolating the remainder, using Newton's "method of differences." The calculator gives sags much more accurately than those obtained by the usual double interpolation on a sag chart; they may be obtained with certainty to within ±0·2 per cent, this being equivalent to 1in on a sag of 42ft. The company's standard 0·4 and 0·175 sq in sag charts are enclosed with the calculator for reference purposes.

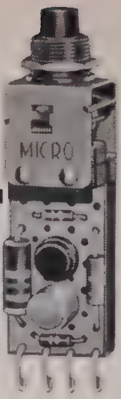
The temperature parameter is often far more important than that of span, a point not often realised. For example, taking a span of 800ft of 0·4 sq in s.c.a. at 49°F, a decrease of 2°F produces a tension corresponding to a reduction of 90ft in the equivalent span.

INSPECTION LIGHT

A device for converting a battery torch into an inspection lamp for use in confined or inaccessible situations has been produced by the Clinton Laboratory, 43, Broomhall Place, Sheffield, 10. Known as the "Prodlite," it consists of an optical probe $\frac{1}{8}$in in diameter combined with a 2·5 V lens bulb. An insulated sleeve version of the probe, $\frac{5}{32}$in in diameter, is also available. The unit can be fitted to any two-cell torch in place of the miniature screw bulb or it can be used with a switch-handle and flexible lead connected to a secondary cell or a 2·5 V transformer secondary in a workshop or laboratory. Both the standard and insulated models are

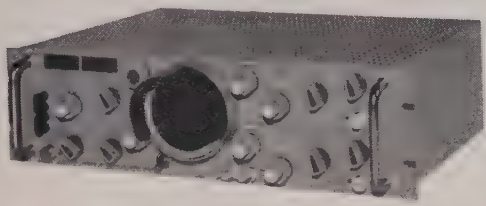


Clinton "Prodlite"



(Left) Honeywell electronic micro-switch

(Right) Amplivox miniature transistor amplifier



(Below) Solartron double-beam rack mounted oscilloscope

priced at 15s 6d and the switch handle and flexible lead cost 12s 6d. Longer or specially shaped probes can be supplied to order at extra cost. A 12 V model for motorists and garage use will be available shortly.

LIQUID-LEVEL ALARM SWITCH

The latest addition to the range of packless flexible-shaft level controllers produced by the Instrumentation Division of Associated Electrical Industries, Ltd., Crown House, Aldwych, London, W.C.2, is the model 26 liquid-level alarm switch. This has no rubbing parts and incorporates a flexible shaft with displacer. The switch is operated by a change in the buoyancy of the displacer, and not by movement of a float "riding" on a changing liquid level. Any displacer motion is transmitted to the micro-switch by a stiff tongue within the flexible shaft. A limit stop is provided to ensure that the stress in the flexible shaft is kept within the elastic limit.

The switch is capable of direct or reverse action and is mounted on standard flanges. A buoyancy change of less than 6 oz provides full actuation of the micro-switch, i.e. a level change of approximately ½in at specific gravity of 1·0. The switch and terminal housing are insulated from the flange by an asbestos gasket, enabling the instrument to be operated at high process temperatures. The permissible temperature range is −65°F to +500°F. The list price of the standard instrument is £19.

ELECTRONIC SWITCH

A new micro-switch incorporating an electronic circuit introduced by Honeywell Controls, Ltd., Greenford, Middlesex, gives a "bounce-free" voltage output for applications involving high-speed electronic components that operate in less than a microsecond. Four basic circuits are available: one gives a positive output to accommodate resistive loads of 100-500 Ω, another 500 Ω or greater, and two give a negative output voltage at these loads. The output voltage is only 1-4 per cent less than the input. The operating temperature range is 32°-130°F (0°-55°C). A variety of pushbutton and toggle assemblies is available though the circuit package can be supplied as a unit for any double-throw switch.

PROJECTION DIGITAL INDICATOR

The "Digivisor" developed and produced by the Electrical Apparatus Co., Ltd., St. Albans, Herts., is an illuminated digital indicator incorporating a miniature moving coil unit having a micro film fitted to the moving element in place of the normal pointer. A single 6 V lamp provides illumination and the image of the film characters—normally 0-9 for in-line read-out—is projected on to the viewing screen. The power required is such that the unit can be used in electronic counters and computers, etc., directly from transistorised decade units without intermediate amplification. The projected image is ⅞in high. The unit has front fixing brackets with centres at 2¼in and the case dimensions are 1¾in high by 1¼in wide by 6in deep.

RACK MOUNTED OSCILLOSCOPE

The rack mounted double-beam oscilloscope CD 1016 announced by Solartron Laboratory Instruments, Ltd., Cox Lane, Chessington, Surrey, has two identical Y amplifiers, bandwidth of d.c. to 5 Mc/s (−3 dB), with a rise time of approximately 70 mμsec. Nine calibrated sensitivity ranges cover 100 mV/cm to 50 V/cm with ±5 per cent accuracy. In addition a fine control gives continuous coverage up to approximately 100 V/cm. The integral a.c. preamplifier preceding Y_2 gives six additional sensitivity ranges with a maximum sensitivity of 1 mV/cm. The input impedance is 1 MΩ and 30 pF. Inputs may be "floated" up to 500 V (+ve or −ve) relative to chassis for displaying signals isolated from earth.

The time base covers 1 cm/μsec to 2 cm/sec in eighteen calibrated ranges, in 1-2-5 sequence with ±5 per cent measuring accuracy. A fine control with a calibration position gives continuous coverage to 1 cm/sec. The maximum sweep speed of 5 cm/μsec may be obtained by using X expansion. The time-base waveform (10 V pk-pk) is available at a socket on the front panel.

A 30 V bright-up pulse derived from a separate bi-stable circuit, d.c. coupled to the cathode ray tube, gives bright displays at all sweep speeds. Provision is also made for external brightness modulation. A square wave of ½ V pk-pk ±1 per cent, at mains frequency, is available for time-base calibration and Y sensitivity. A 3½in diameter double gun c.r.t. is used. The mains input is 100-125 V/200-250 V, 45-66 c/s and dimensions are 5¼in by 19in by 14½in (13in behind front panel).

MINIATURE TRANSISTOR AMPLIFIERS

A range of small audio frequency amplifiers giving component densities up to several hundred per cubic inch is announced by Amplivox, Ltd., Beresford Avenue, Wembley, Middx. The larger amplifier illustrated enables a miniature magnetic microphone to be used in a carbon microphone circuit for better intelligibility and signal/noise ratio. It is available in several forms, one of which is encapsulated and designed to meet severe climatic requirements. The sub-miniature unit with a component density of over 300 per cubic inch is a three-transistor amplifier mounted on a printed circuit board measuring about 0·5in by 0·2in. The gain, which is stabilised by feedback, is 76 dB and the power output is approximately 1 mW into 600 Ω.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1956

16740. Associated Electrical Industries, Ltd.—Coil winding machines. 30th August, 1957. (862555.)

18720. Electric & Musical Industries, Ltd. —Servo mechanisms. 4th June, 1957. (863114.)

19286. British Insulated Callender's Cables, Ltd.—Electric isolating switches for railway sections and for other purposes. 20th June, 1957. (862681.)

26552. Pye, Ltd.—Colour television projection systems. 30th August, 1957. (862643.)

27244. English Electric Co., Ltd.—Fuel element cans for nuclear reactors. 5th December, 1957. (862609.)

33500. English Electric Co., Ltd.—Electric fuseholders. 1st November, 1957. (862813.)

36412. Associated Electrical Industries, Ltd.—Insulating support of helical conductors. 30th November, 1957. (863063.)

39630. Minneapolis-Honeywell Regulator Co.—Transistors. 31st December, 1956. (862839.)

1957

3936. Associated Electrical Industries, Ltd.—Information transmission systems. 24th January, 1958. (862870.)

6532. Siemens-Schuckertwerke A.G.—Electric circuit including a power thermistor. 27th February, 1957. (863104.)

8350. Evans, O. (S. W. Farber, Inc.).—Electrically heated cooking utensils. 13th March, 1957. (863118.)

8994. Thermel, Inc.—Electric heaters. 19th March, 1957. (862959.)

11280. General Electric Co., Ltd.—Electrical apparatus for providing an electrical indication of the relative positions of relatively movable means. 2nd April, 1958. (863027.)

14878. Plessey Co., Ltd.—Attachment of electrical terminal wires to metal bodies. 15th July, 1957. (862815.)

15115. Philips Electrical Industries, Ltd. —Image intensifiers. 13th May, 1957. (863121.)

16740. Krimholtz, J.—Rectification of a.c. supplies. 23rd May, 1958. (862724.)

17201. Siemens-Schuckertwerke A.G.—Control circuits. 30th May, 1957. (862981.)

17410. Associated Electrical Industries, Ltd.—Electric power cables. 28th May, 1958. (862654.)

18339. Standard Telephones & Cables, Ltd.—Electric discharge device. 11th June, 1957. (862982.)

18733. Radiation Research Corporation.—Provision of dielectric coatings on objects. 13th June, 1957. (862585.)

18753. Schweizerische Wagons- und Aufzugefabrik Aktiengesellschaft Schlieren-Zurich.—Control systems for electric lift motors. 13th June, 1957. (862954.)

19614. Minneapolis-Honeywell Regulator Co.—Semiconductor devices. 21st June, 1957. (862840.)

19780. United States Atomic Energy Commission.—Method of cooling a nuclear reactor. 24th June, 1957. (862587.)

20715. Associated Electrical Industries, Ltd.—Constant voltage a.c. circuits. 27th June, 1958. (863135.)

20763. Pintsch Electro G.m.b.H.—Systems for compressing the frequency band of pulse trains. 1st July, 1957. (862955.)

22087. Telefunken G.m.b.H.—Multiple electron beam tubes. 12th July, 1957. (863080.)

22157. Standard Telephones & Cables, Ltd.—Electrical interlocking route setting equipment with overlap track fouling protection. 12th July, 1957. (863081.)

27123. Soc. d'Electronique et d'Automatisme.—Means for transfer of information in circuits incorporating magnetic cores. 28th August, 1957. (Addition to 825949.) (863069.)

27751. International Business Machines Corporation.—Electronic adders including transistors. 3rd September, 1957. (863161.)

28284. James Scott & Co. (Electrical Engineers), Ltd.—Microwave frequency discriminators. 15th August, 1958. (863165.)

30342. Philco Corporation.—Electrical heater elements, cathode elements, and cathode assemblies for electron tubes. 27th September, 1957. (863084.)

30742 and 32239. Centre Nationale de la Recherche Scientifique.—Apparatus for machining by electric spark discharges. 1st and 15th October, 1957. (862901/2.)

32247. General Electric Co., Ltd.—Electrical coding apparatus for use, for example, in telemetering systems. 3rd October, 1958. (863028.)

34077. Transformatorenwerk K. Liebknecht Veb.—Lightning arrestors. 31st October, 1957. (862550.)

36142. Marconi's Wireless Telegraph Co., Ltd.—Amplifiers. 31st July, 1958. (862570.)

36641. Research-Cottrell, Inc.—Control circuits for thyratrons. 25th November, 1957. (862656.)

36642. Research-Cottrell, Inc.—Control systems for electrostatic precipitators. 25th November, 1957. (862657.)

39078. Sunbeam Corporation.—Electrically operated dry shaver. 16th December, 1957. (862726.)

39840. Zenith Radio Corporation.—Cathode-ray tubes for producing multicolour displays. 23rd December, 1957. (862957.)

1958

318. Philips Electrical Industries, Ltd.—Electric lamps having a cap with an adjusting ring. 3rd January, 1958. (863020.)

512. Smith & Sons (England), Ltd., S.—Devices for locating electric conductors in tubular ducts. 2nd January, 1959. (862820.)

3074. Standard Telephones & Cables, Ltd.—Method of automatically manufacturing frame grids. 30th January, 1958. (862925.)

5603. Perrone, A., and Salvi, A.—Spacers for high voltage, aerial transmission lines. 20th February, 1958. (Addition to 739796.) (863126.)

6229. Polymer Corporation.—Laminated strip product for electrical purposes. 26th February, 1958. (863127.)

6431. Dunkel, M. M. (trading as Leybold's Nachfolger, E.).—High vacuum ion-getter pump. 27th February, 1958. (862892.)

8258. Westinghouse Electric Corporation. —Dynamo-electric machines. 14th March, 1958. (863073.)

9032. General Electric Co., Ltd.—Fault indicating arrangements for electric circuits. 19th March, 1959. (863128.)

11312. General Electric Co., Ltd.—Arrangements of the kind which includes the electrical position encoder for providing electric signals that are representative in digital form of the angular position of a rotatable shaft. 2nd April, 1959. (863029.)

13956. Associated Electrical Industries, Ltd.—Electrical terminal assemblies. 9th April, 1959. (863141.)

14362. Babcock & Wilcox, Ltd.—Nuclear reactors and fuel elements therefor. 5th May, 1959. (862623.)

14916. Philips Electrical Industries, Ltd. —Methods of manufacturing bodies of ferromagnetic materials. 9th May, 1958. (862821.)

15292. Foster Transformers, Ltd., and Jennings, R. E.—Automatic voltage regulators. 7th May, 1959. (862728.)

15429. Licentia Patent-Verwaltung G.m.b.H.—Spin dryers. 14th May, 1958. (862894.)

16427. Standard Telephones & Cables, Ltd.—Electrical power supply equipment. 15th May, 1959. (863131.)

17221. Signal-Stat Corporation.—Electric snap-action switch device. 29th May, 1958. (863041.)

17614. Fitter & Poulton, Ltd.—Electric switch or socket outlet boxes. 28th May, 1959. (862598.)

22022. United Kingdom Atomic Energy Authority.—Nuclear reactor installations. 16th June, 1959. (862624.)

23165. Slee, K. V.—Electrical pressure welding machines. 15th October, 1959. (863045.)

24369. Self-Changing Gears, Ltd.—Automatic electrical speed changing control means for railway vehicles. 28th July, 1959. (862757.)

33906. Allmänna Svenska Elektriska A.B. —Two dynamo-electric machines arranged on a common shaft together with an intermediate flywheel. 23rd October, 1958. (863054.)

35551. Siemens-Schuckertwerke A.G.—Production of semiconductor devices. 5th November, 1958. (863010.)

1959

1563. Alford, A.—Electric coaxial cable switches. 15th January, 1959. (863185.)

6359. Miwag Mikrowellen A.G.—Switch for a power supply unit of a magnetron transmitter. 24th February, 1959. (863056.)

11810. Square D Co.—Devices for enclosing and supporting electrically operated means. 8th April, 1959. (863094.)

12588. United States Atomic Energy Commission.—Continuous plasma generator. 14th April, 1959. (862900.)

14225. Westinghouse Electric Corporation.—Electroluminescent cells and methods of operating such cells. 27th April, 1959. (863107.)

14898. Western Electric Co., Inc.—Transformers. 1st May, 1959. (863108.)

16927. United States Atomic Energy Commission.—Device for producing energetic ions. 19th May, 1959. (862835.)

17140. Westinghouse Electric Corporation.—Preparation of single crystals from the vapour phase. 20th May, 1959. (862600.)

17151. Tesla Narodni Podnik.—Amplifier including valves with increased effective slope. 20th May, 1959. (862790.)

17283. Erie Resistor Corporation.—Solder coated strip for forming terminals. 21st May, 1959. (862919.)

18373. Philips Electrical Industries, Ltd. —Magnetic shift registers. 29th May, 1959. (862794.)

18601 Heraeus G.m.b.H., W. C.—Vacuum electric arc furnace provided with a consumable electrode. 1st June, 1959. (862931.)

22927. Standard Telephones & Cables, Ltd.—Coders for electric pulse code modulation systems. 3rd July, 1959. (Addition to 847334.) (862855.)

23917. Zeiss-Stiftung, C. (trading as Zeiss, C.).—Wide band isolating transformer. 13th July, 1959. (862737.)

24327. Licentia Patent-Verwaltungs-G.m.b.H.—Electric vibrator particularly for clocks. 15th July, 1959. (862738.)

26363. Telefunken G.m.b.H.—Cathode-ray tube display arrangements. 31st July, 1959. (863110.)

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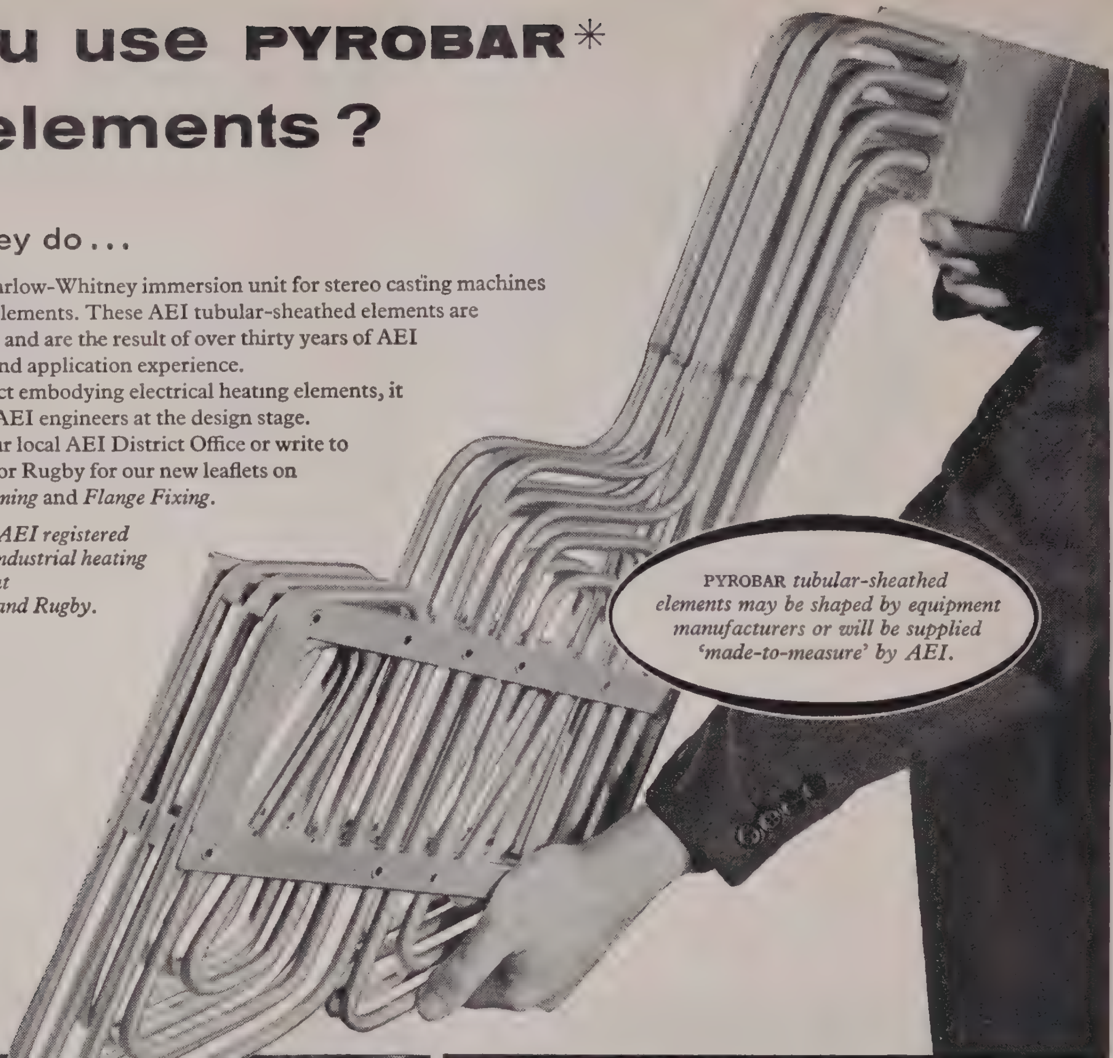

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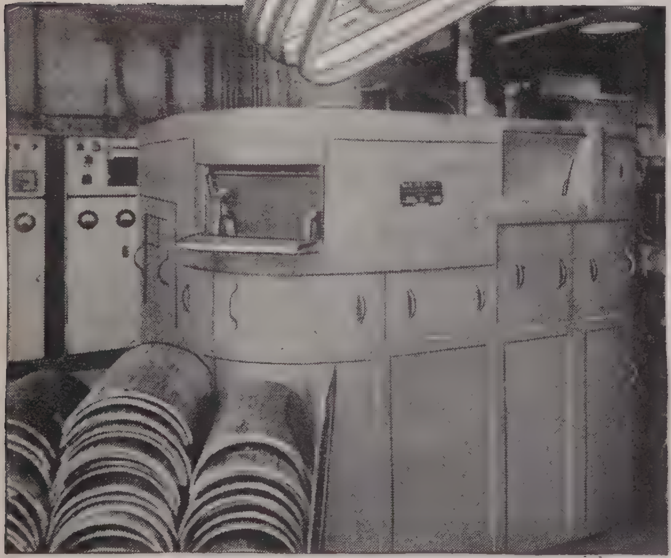

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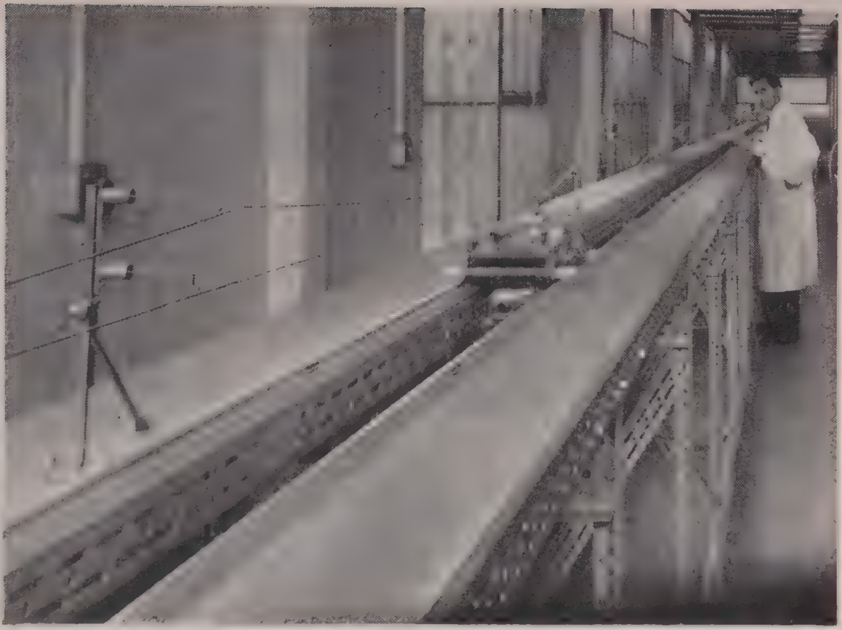
Summary of a paper entitled "A Dynamic Model for Studying the Behaviour of the Overhead Equipment used in Electric Railway Traction" by D. S. Farr, A.M.I.E.E., H. C. Hall, M.Sc., and Dr. A. L. Williams, read at a meeting of the Utilisation Section of the Institution of Electrical Engineers held on 16th March



Model pantograph-carrying trolley travelling at speed in the test enclosure

RAILWAY TRACTION MODEL

By A. L. WILLIAMS, Ph.D., M.Sc., M.I.E.E.*

It may be practically impossible, or economically prohibitive, to carry out experiments on full-scale overhead conductor electric railway systems, and a complete theoretical study may not be practicable because of mathematical complexity. The design and construction of a dynamically equivalent model, capable of representing high-speed running up to 100 m.p.h., was therefore considered to provide means of obtaining an understanding of the behaviour of such a system and to investigate the effect of changes in design.

Ideally, so that the contact pressure may be constant, the conductor should be continuous, at a constant height above the track, and mechanically uniform. The pantograph should exert a constant upthrust at all speeds. These conditions cannot be realised in practice. The conductor is installed only in lengths of about a mile, its height changes at overbridges, tunnels and level crossings, it is often supported at irregular intervals, and it frequently contains supported insulation. The pantograph has inertia and aerodynamic resistance and, hence, its characteristics are to some extent speed dependent.

The problems are considerably greater with the high-voltage systems (e.g. 25 kV) now being used, because the high-voltage conductor is lighter and more flexible, but needs larger insulators than with a low-voltage system (1,500-3,000 V). In each design arrangement, a main catenary is used, spanning the distance between supports which are up to 240ft apart. In simple equipment, the contact wire is suspended from this at intervals of 15-20ft by means of droppers. In compound equipment, the contact wire is suspended from an auxiliary catenary, itself suspended from the main catenary. In stitched equipment, the contact wire is suspended from an additional wire attached to the main catenary on each side of a structure.

Before constructing any model, it is necessary to explore the situation theoretically so as to ensure that all relevant modes of behaviour of the system are faithfully reproduced. While the theory need not be complete, a thorough understanding of the physical principles involved is essential and judgment must be exercised in deciding which properties of the system must be taken into account. Dimensional analysis is then used to ensure that the behaviour of the model will be realistic.

Model Dimensions

Scaling factors must be chosen so that the model can be conveniently housed and so that measurements can be made with sufficient precision. Suitably scaled-down values of forces in the prototype must produce geometrically equivalent displacements, or be associated with velocities, accelerations, etc., in the model which are scaled-down values of the corresponding values in the prototype. Therefore, it must be decided what are the operative forces in the prototype, what movements they produce, and which physical properties of the wires and other parts of the equipment determine its reaction.

The forces on the wire are its weight, the vertical upthrust from the pantograph, longitudinal tension, wind pressure and aerodynamic forces caused by the passage of a train. These forces produce movement of the catenaries and contact wires with accelerations determined by the inertial mass of the system. The properties of the overhead system which determine the nature of these movements are the mass per unit length of the wires, the inertial mass of other components, the fractional extension per unit force (extensibility) and the flexural rigidity of the wires.

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* British Insulated Callender's Cables, Ltd.

The scaling factors for length, mass and time can be chosen to suit convenience, provided that certain restrictions imposed by dimensional requirements are regarded. It transpires that there are further severe restrictions imposed by available materials and constructions.

The model is used in the same gravitational field as the prototype, so that the scaling factor for acceleration must be unity. A convenient scaling factor for length would be about 40 and, because the tension in the contact and catenary wires is about 2,000 lb, whereas the pantograph upthrust is only 20 lb, the scaling factor for force should be 1,000-2,000. With these factors as rough guides, it can be shown that it is impossible to model the prototype wires by the use of simple circular wires; materials having the impossibly high density of 40 gm/cu cm would be needed.

Non-metallic threads (e.g. polythene, rubber, nylon, etc.) were ruled out because of the dependence of physical properties upon temperature, humidity and mechanical loading; the use of springs, twisted strip, crimped wire, etc., was not possible because of the difficulty of obtaining sufficiently low scaling factors for force.

Metal Bead Construction

The problem was to find a form of construction in which a sufficiently large mass per unit length was accompanied by a large extensibility and a low flexural rigidity, and it was finally solved by the use of metal beads threaded upon fine wire. As the pantograph must be able to slide freely along the modelled contact wire, the beads must be cylindrical, concentric and at the closest practicable spacing, and the contact strip on the model pantograph is so designed that it bridges three or four beads simultaneously.

To obtain an approximate design, the mass per unit length is ignored, and the elasticity regarded as being provided by the short pieces of wire between the beads. For beads $\frac{1}{16}$in long, spaced $\frac{1}{32}$in apart, a material with a value of E of about 1×10^7 is required, a quite reasonable value. The diameter of the beads, of brass, to provide the required mass is about 0·13in.

	Wire		Beads		
	Material	Diameter (in)	Material	Diameter (in)	Length (in)
Contact	Brass	0·0129	Brass	0·0925	0·072
Main catenary ...	Tungsten	0·0045	Brass	0·0738	0·067
Auxiliary catenary ...	Tungsten	0·0032	Brass	0·0463	0·053

As the beads themselves make some contribution to the elastic properties, which also depend upon the method of attachment, the final design was obtained by measurements on short experimental lengths of beaded wire. This led to modification of the scaling factors, which became 32·5 for length and 1,220 for force. Because of the different elastic properties of the full-scale catenaries, which are stranded, and the contact wire, tungsten wire was used to simulate the former and brass the latter. The table gives the final dimensions of the modelled wires.

All other parts of the equipment which might play some part in its dynamic behaviour were scaled in the same length ratio; moving parts, such as hinged supports, droppers, etc., had masses adjusted to achieve a correctly scaled inertia.

The models are built in a closed loop with an 80ft test section in each of the two straight sides, so that half-a-mile of track can be scaled. The test sections are erected within temperature-controlled enclosures.

The pantograph is modelled by correctly scaling the length, mass and distribution of mass of each moving part. To carry the pantograph at a speed of up to 18 m.p.h. (representing about 100 m.p.h.), an automatically controlled trolley is used, fitted with devices for indicating position, speed and acceleration, signals being transmitted to a central recording unit.

Movements of the contact wire and catenaries, at any position, are measured either electrically or optically, using a high-speed camera where necessary. Initial trials have shown good agreement between the actual and the mathematically predicted behaviour of the full-scale system and research work using the models is now in progress.

Standards Engineers' Conference

THE seventh annual conference of engineers and others concerned with the application of standards, will be held on 9th and 10th May, and will be opened by Viscount Hailsham, Minister for Science.

The first day of the conference will consist of plenary sessions at the Connaught Rooms, London, when Sir Stanley Harley (Coventry Gauge & Tool Co., Ltd.) will take the chair. After the formal opening by Lord Hailsham, a contribution on the trades union viewpoint on industrial standards will be given by Mr. G. Doughty of the Association of Engineering and Shipbuilding Draughtsmen. Papers will also be given on "An Integrated Standards Programme in the Company" (Mr. F. E. Butcher of Joseph Lucas, Ltd.), "Standards in Product Development (Electronics)" (Mr. D. F. Egan of Mullard, Ltd.), and "Standards in Market Research and Sales" (speaker to be announced).

The second day's programme, to be held at British Standards House, will consist of three parallel sessions in the morning and three in the afternoon, to discuss, in smaller groups, various topics, including the application of a standards system in a smaller company; variety reduction by manufacturers and users of steel; and the Unified screw thread in British industry.

Previous conferences led to the creation of the new "Register of Standards Associates" under the aegis of the B.S.I., and the programme committee of the Register has been active in the planning of this forthcoming seventh conference.

M.I.T. CENTENNIAL

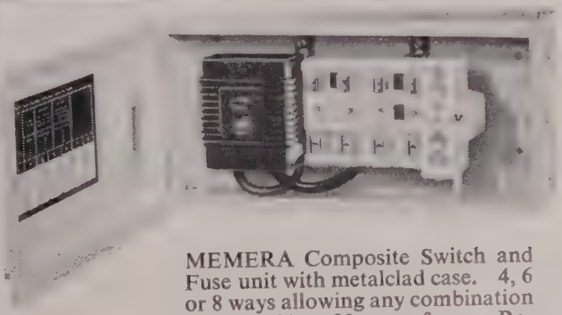
FROM 2nd to 10th April the Massachusetts Institute of Technology will celebrate its "Centennial" with a series of conferences in which over 150 eminent scientists, educationists and other scholars will participate. Mr. Harold Macmillan, the Prime Minister, is to give an address on 7th April, and among the other events will be an address by Sir John Cockcroft and the presentation to him of the $75,000 Atoms for Peace Award.

MEM

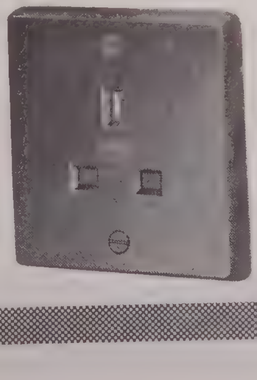
FOR BASILDON NEW TOWN IN ESSEX

This aerial view shows the Lee Chapel area of the Basildon new town housing scheme, where MEM switch and fuse units and 13 amp. socket outlets were used exclusively. The extensive nature of this contract reflects the increasing use of MEM switchgear and accessories on the country's major housing projects.

Messrs. Burles and Newton and Messrs. Seymour Harris and Partners in association with Mr. Anthony B. Davies, Chief Architect/Planner, Basildon Development Corporation. The electrical contractors were Messrs. Holliday, Hall and Stinson Ltd.



MEMERA Composite Switch and Fuse unit with metalclad case. 4, 6 or 8 ways allowing any combination of 5, 15, 20 or 30 amp. fuses. Rewirable or H.R.C. cartridge fuse carriers.



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CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where " Contracts Open " are advertised in our " Official Notices " section the date of the issue is given in parentheses

Australia.—P.M.G.'s Department, Melbourne. 4th May. Repeater equipment. (E.S.B. 8983/61.)* 8th June. Telephone and radio equipment. (E.S.B. 8982/61.)*

Barrow-in-Furness. — Borough Council. 10th April. Pumping plant for Sandgate pumping station. J. N. Flitcroft, borough engineer, Town Hall.

Bournemouth.—Corporation. 8th April. Street lighting equipment. (See this issue.)

Canada.—Manitoba Hydro-Electric Board. 30th May. Generators for Grand Rapids station. (E.S.B. 9130/61.)*

Ceylon.—Ministry of Agriculture, Land, Irrigation and Power. 11th April. Cable. (E.S.B. 8789/61.)*

Colombia.—Autonomous Regional Corporation of the Cauca. 14th April. Substation equipment. (E.S.B. 8150/61.)*

Durham.—County Council. 5th April. Electrical installations in Seaham Harbour Grammar Technical School and Staindrop New Modern School. (See this issue.)

Egypt.—Ministry of Public Works. 24th April. Telephone exchange at Aswan power station. (E.S.B. 9184/61.)* 30th April. Three diesel generating sets. (E.S.B. 8619/61.)*

Formosa.—Central Trust of China. 12th April. Mining equipment, pumps and electric motors. (E.S.B. 8800/61/I.C.A.)* 14th April. Twelve 161 kV gang-operated air-break switches. (E.S.B. 9101/61/I.C.A.)* 18th April. Refrigerating equipment. (E.S.B. 8999/61/I.C.A.)* 21st April. Substation switchgear and transformers. (E.S.B. 9436/61/I.C.A.)*

Germany.—Bundesamt für Gewerbliche Wirtschaft, Frankfurt-am-Main. N.A.T.O. Infrastructure Contract. Substations, cable and standby power units. Applications to tender by 27th March. (G.D. 5678/58(95).)†

Ghana.—Ghana Supply Commission. 12th April. P.v.c. insulated cadmium copper wire and bare hard drawn copper wire. (E.S.B. 8143/61.)* Radio-telephone equipment. (E.S.B. 9162/61.)*

India.—Heavy Electricals, Ltd. 10th May. 132 kV insulators; last date for purchasing tender forms, 31st March. (E.S.B. 8151-2/61.)* 12th May. Insulating materials. Last date for purchasing tender forms 31st March. (E.S.B. 8960-61/61.)*

Madras State Electricity Board. 10th April. Cables and accessories. (E.S.B. 9123/61.)*

Rihand Hydro-Electric Design Directorate, Kanpur. 31st March. 132 kV single circuit transmission line on double circuit towers between Mau and Gorakhpur. (E.S.B. 8973/61.)* 28th March. Metering equipment. (E.S.B. 8988/61.)*

Iran.—Iranian Sugar Factories Co. 9th May. Thirty-seven electric and two diesel pumps. (E.S.B. 8949/61.)*

Iraq.—Central Foreign Purchasing Board. 26th April. Telephone cable. (E.S.B. 8917/61.)* 29th April. Automatic telephones and spare parts. (E.S.B. 8970/61.)*

Korea.—Government Office of Supply. 11th April. Equipment, including radio and electrical. (E.S.B. 8742/61.)*

Lebanon.—International Airport, Beirut. 11th April. Radio transmitter set. (E.S.B. 8911/61.)*

Manchester.—City Council. 4th April. Electrical installation in shops and flats at the Civic Centre, Wythenshawe. 10th April. Electrical installation in Whitebrook School for the Deaf, Fallowfield. City architect, P.O. Box 488, Town Hall.

New Zealand.—Director General (Stores Division), G.P.O., Wellington. 26th April. Telephone cable. (E.S.B. 8738 and 8739/61.)*

Pakistan.—Director General of Supply and Development. 10th April. Cables, wire and terminal boxes. (E.S.B. 9160/61.)*

South Africa.—Transvaal Provincial Tender Board. 7th April. One 5 kVA and nine 3 kVA generating sets. (E.S.B. 8980/61.)*

Staffordshire.—Stafford College of Technology. 29th April. (a) Demonstration electrical equipment for electrical laboratories. (b) Apparatus for chemical laboratory. (c) X-ray apparatus for nucleonic block. (See this issue.)

Thailand.—Post and Telegraph Department. 7th April. Radio equipment. (E.S.B. 9450/61.)*

Tunisia.—Direction de l'Aeronautique Civile et de la Météorologie. 15th April. Radio communication equipment. (E.S.B. 8780/61.)*

United States.—Bureau of Reclamation. 4th April. Control boards for substations. (E.S.B. 8903/61.)* 6th April. Substation supervisory control gear. (E.S.B. 9407/61.)*

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Axminster.—Extensions to carpet factory; Axminster Carpets, Ltd., Gamberlake, Axminster.

Ayr.—Fire station and area headquarters, Content House site (£90,000); J. A. Carrick, architects, 7, Alloway Place.

Belfast.—Branch bank at Shaftesbury Square for the Ulster Bank, Ltd. (£150,000); Houston & Beaumont, architects, 30, College Gardens, Belfast.

Bournemouth.—Flats (56), Branksome Wood Road; Prowting Estates, Ltd., 127, High Street, Ruislip.

Cambridge.—Printing works; Cambridge University Press.

Carlisle.—School, Morton; Johnston & Wright, architects, Castle Street.

Chelmsford.—Flats and maisonnettes (72), Meadgate estate; borough engineer, Municipal Buildings, Duke Street.

Houses (312), Moulsham Lodge estate; W. Goodchild & Co., 123, South Street, Romford.

Chester-le-Street.—Offices for R.D.C.; F. Bowman, architect, Estate Office, Birtley, Co. Durham.

Chiswick.—Shops and offices, High Road; Derek Avery & Associates, 56, Kingsway, London, W.C.2.

Factory and offices; Hudsons Motors, Ltd., Great West Road.

Cramlington (Northumberland).—Offices, workshops, etc., on site of former aerodrome; Dowsett Engineering Construction, Ltd., Durham Road, Gateshead.

Daventry.—Further 100 houses for letting to employees of British Timken, Ltd.; borough surveyor.

Dumfries.—Houses (93), Lochside estate; burgh surveyor.

Dunstable.—R.C. church, West Street; Arthur Farebrother & Partners, architects, 99, Seymour Grove, Manchester, 16.

Durham.—Extensions to colleges for Durham University including Stage 3 of Grey College and reconstruction of Owengate (architects, Worthington & Son, 178, Oxford Road, Manchester); new arts block (Marshall Sisson, architect, Godmanchester, Huntingdon); and new St. Aidan's College (Basil Spence & Partners, architects, 48, Queen Victoria Street, W.1.).

New schools at Chilton, West Cornforth, Jarrow West Simonside, South Stanley, and Staindrop, grammar/technical school at Ferryhill, infants' school at Peterlee Shotton Hall, and C. of E. school at Lanchester; county architect, South Street, Durham.

Police houses (49) on various sites throughout the county; county architect, South Street, Durham.

Eastbourne.—Four-storey office block, Ivy Terrace; Hallmark Group, 26, Regency Square, Brighton.

Eston (Yorks.).—Residential hotel, South Bank; J. H. Barker, architect, S. Smith Old Brewery, Ltd., Tadcaster.

Gateshead.—Conversion of Rex Cinema into shops and offices; E. M. Lawson, architect, Barras Buildings, Barras Bridge, Newcastle-on-Tyne.

Hartlepool.—Hotel, Maple Avenue, for J. W. Cameron & Co.; E. M. Lawson, architect, Barras Buildings, Barras Bridge, Newcastle-on-Tyne.

Hinckley.—Office block; Sketchley, Ltd.

Horsham.—Offices, Hurst Road, for North West Sussex Water Board; Godman & Kay, architects to Board, 13, North Parade.

Houghton-le-Spring.—Mineral water factory proposed at Penshaw; S. H. Lawson & Partners, architects, Emerson Chambers, Blackett Street, Newcastle-on-Tyne.

Kendal.—Courthouse, fire station and ambulance headquarters; county architect, County Hall, Kendal.

Leicester.—Final phase of work on Wyggeston Boys' School (£103,500); county architect, Leicester.

London.—Library, Stafford Road, Bow; J. Stinton Jones & Partners, consulting engineers, 21, Gloucester Place, W.1.

Dwellings (36), Coldbath Street, Greenwich; Guise, Davies & Upfold, architects, 132, Sloane Street, S.W.1.

Student nurses' training school, Ogle Street, Marylebone; Young & Hall, architects, 9, Southampton Row, W.C.1.

Lowestoft.—Building extensions; Birds Eye Foods, Ltd., North Denes.

Luton.—Hangar at Municipal Airport; borough engineer.

Maghull.—Hotel, Eastway/Tensing Road site; Greenall Whitley & Co., Ltd., 22, Market Street, Wigan.

Manchester.—Works extensions; J. Garland & Co., Ltd., Bennett Street, Openshaw.

Mansfield.—Works extensions; Sanderson & Robinson, Ltd., Western Avenue.

Margate.—Additions to St. Crispin's County Primary School (£56,000); E. T. Ashley Smith, county architect, Springfield, Maidstone.

Market Harborough. — Extensions to Council Offices; surveyor, Brooklands, Northampton Road.

Northfleet.—Research laboratory; Modern

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* This information is extracted from the Board of Trade *Export Service Bulletin*. Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given. † Telephone: Trafalgar 8855, Ext. 2010.

Industrial Finishes, Ltd., Thames Chemical Works.

North Riding.—Junior school, Malton; W. W. Atkinson, architect, 4, Raymond Buildings, Grays Inn, London, W.C.1.

Peterborough.—Private housing development on land between Fulbridge Road and Paston Ridings; C. W. Shelton, Ltd., South Street, Stanground, Peterborough.

Extensions to Technical College (£200,000); architect to Joint Education Board, Bridge Street.

Improvements and extensions to the Lincoln Road Boys' Secondary School in 1961-62 programme (£70,000); Warwick & Ellis, architects, 43a, Priestgate, Peterborough.

Extensions to Walton Secondary Modern School (£90,000); Dodson & Son, architects, Priestgate, Peterborough.

Petersfield (Hants.).—Houses (34), Tower Road estate, Liphook; R.D.C. surveyor, The Old College.

Salisbury and Wilton.—Houses (80); surveyor, 26, Endless Street, Salisbury.

Shropshire.—Old people's homes, Oswestry and Shrewsbury; county architect, Column House, London Road, Shrewsbury.

Southampton.—College of Technology (£540,000); borough architect.

South Shields.—Houses (33), and three-storey blocks of flats, Green Street; J. Reid, borough engineer.

Spalding.—Grammar school extensions; Ruddle & Wilkinson, architects, 32, Hall Place.

St. Albans.—Grammar school (£303,934); county architect, County Hall, Hertford.

Stockton-on-Tees.—Houses (116), Urlay Nook; G. W. T. Brown, surveyor, Yarm Lane, Stockton.

Stoneleigh.—Baptist church, Chadacre Road; Dawney & Carpenter, architects, 131, Victoria Street, London, S.W.1.

Stratford-on-Avon.—Flats and houses (34), Masons Road estate; P. C. Smart, borough engineer, Rother Street.

Sunderland.—Eleven-storey blocks of flats in the Coronation Street area and rebuilding of Milton Hall Special School, Brampton; borough architect, Grange House, Stockton Road.

Tadcaster.—Proposed new police divisional headquarters and courthouse; F. W. Glover, county architect, Bishopgarth, Westfield Road, Wakefield.

Tynemouth.—Development of departmental stores for George Swan, Ltd., North Shields; Mauchlen, Weightman & Elphick, architects, 12, Saville Row, Newcastle-on-Tyne.

Wakefield.—Works extensions; Wakefield Shirt Co., Ltd., Thornes Lane.

Wallasey.—Swimming baths, Moreton; Ernest Griffiths & Sons, heating and electrical consultants, Allport Road, Bromborough.

Wallsend.—Office additions, Station Road, for Swan Hunter & Wigham Richardson, Ltd.; T. F. Burns & Partners, consulting engineers, 3, Ellison Place, Newcastle-on-Tyne.

Watford.—Additions and alterations to Council Offices; surveyor, 99, Langley Road.

Welwyn Garden City.—Schools, Digswellbury (£59,877) and Harwood Hill (£55,804); county architect, County Hall, Hertford.

West Hartlepool.—Houses (28), Owton Manor; A. G. Sinclair, borough architect.

Whitley Bay.—Grammar/technical school at Valley Gardens; county architect, 30, Great North Road, Newcastle-on-Tyne.

Wisbech.—Police houses and family group home, Norwich Road; county architect, County Hall, March.

Wolverhampton.—Special junior and adult training centre, Oxley (£77,350); borough surveyor, Town Hall.

Worthing.—Supermarket, shops, flats and offices, Broadwater Road and Rectory Gardens sites; Gotch & Partners, architects, 26, Regency Square, Brighton.

Wycombe.—Dwellings (101); surveyor, 17, High Street, High Wycombe.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

MONDAY, 27th MARCH

Birmingham.—James Watt Memorial Institute, 6 p.m. I.E.E. South Midland Electronics and Measurement Group. "New Amplifying Techniques," by Prof. C. W. Oatley.

Regent House, St. Philip's Place, Colmore Row, 6 p.m. I.E.S. Birmingham Centre. "Hospital and Operating Theatre Lighting," by S. Hubbold.

Cardiff.—South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Utilisation Group. "Some Notes on the Electrical Requirements of General Cargo Docks," by E. R. Radway.

Derby.—Louis Room, St. James's Restaurant, St. James's Street, 7 p.m. Institution of Production Engineers, North Midland Region. Annual general meeting followed by a film show.

Leicester.—Demonstration Theatre, East Midlands Electricity Board, Charles Street, 6.15 p.m. I.E.S. Leicester Centre. "An Electrical Engineer in Local Government Service," by D. L. Richards and A. E. Griffiths.

London.—Post Graduate Medical School, University of London, Hammersmith, W.12, 3 p.m. British Institution of Radio Engineers, Medical Electronics Group. Symposium on "Electronic Instruments for Cardiac Surgery."

Manchester.—Reynolds Hall, Manchester College of Science and Technology, 7.15 p.m. Institution of Production Engineers, North Western Region. "Electrified Railway Freight Handling Systems," by G. R. Higgs. Preceded by the annual meeting at 6.30 p.m.

Newcastle-on-Tyne.—Neville Hall, 6.30 p.m. I.E.E. North Eastern Centre. "Technical and Economic Aspects of the Supply of Reactive Power in England and Wales," by W. Casson and H. J. Sheppard.

Watford.—Compass Hotel, 7.45 p.m. A.S.E.E. North West London Branch. "Earthing and Earth Leakage Protection of Electrical Installations," by J. A. Robbins.

TUESDAY, 28th MARCH

Birmingham.—Lecture Hall, Byng Kenrick Suite, New College of Technology, Gosta Green, 7 p.m. Institution of Electronics. "Transistor Control for A.C. Generators on London Buses," by E. L. Robinson.

Chester.—M.A.N.W.E.B. Canteen, Princess Street, 6.45 p.m. I.E.E. Mersey and North Wales Graduate and Student Section. "A Description of an Automatic Data Logging System at Capenhurst Works (U.K.A.E.A.)," by B. Nield.

Edinburgh.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South East Scotland Sub-Centre. "The Potentialities of Artificial Earth Satellites for Radiocommunication," by W. J. Bray.

North British Hotel, Princes Street, 7.30 p.m. Institution of Production Engineers, Scotland Region. Ladies' night.

London.—Manson House, 26, Portland Place, W.1. Society of Instrument Technology, Control Section, 5 p.m. "Automatic Optimisation," by Dr. P. E. W. Grensted and O. L. R. Jacobs. 7 p.m. "The Development of an Optimising Controller," by P. F. Sutherby.

21, Bloomsbury Street, W.C.1. Society of Relay Engineers. 11.30 a.m. Annual meeting. 2.30 p.m. "Wired Distribution Networks for Television at Radio Frequencies," by L. E. Hooper-Smith.

Manchester.—A.E.I. Industrial Machine Department, Mosley Road, Trafford Park, 7.15 p.m. I.E.E. North Western Graduate and Student Section. "Influences on the Design of Squirrel-Cage Motors," by M. R. Harris.

Newcastle-upon-Tyne.—Stephenson Building, King's College, 6.15 p.m. Institute of Marine Engineers, North East Coast Section. "Materials for Advanced Steam Conditions and their Influence on Operation of Turbines and Boilers," by Cdr. H. E. C. Hims and S. H. Frederick.

Preston.—The Bull and Royal Hotel, 7.15 p.m. Combustion Engineering Association, North Western Region. "Industry and the Clean Air Act," by Dr. J. S. G. Burnett.

WEDNESDAY, 29th MARCH

Cardiff.—Welsh College of Advanced Technology, 6.45 p.m. Society of Instrument Technology, South Wales Section. Annual meeting followed by "Feed Back," by R. S. Medlock.

Liverpool.—Exchange Hotel, Tithebarn Street. Institution of Production Engineers, North Western Region. 7.30 p.m. Annual meeting. 8.30 p.m. Film show.

London.—London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1, 3 p.m. British Institution of Radio Engineers. Symposium on "Electronic Instrumentation for Nuclear Power Stations."

1, Birdcage Walk, Westminster, S.W.1, 3.30 p.m. Institution of Mechanical Engineers. Ordinary meeting in conjunction with the Steam Plant Group. "An Experimental Study of the Flow Conditions and Pressure Drop of Steam-Water Mixtures at High Pressures in Heated and Unheated Tubes," by R. W. Haywood, C. A. Knights, C. E. Middleton and J. R. S. Thom.

Criterion Restaurant, Piccadilly Circus, S.W.1, 2.15 p.m. Combustion Engineering Association. "Modern Developments in Water Tube Boiler Design," by Dr. Ing. Heinrich Vorkauf.

Sheffield.—Grand Hotel, 6.30 p.m. I.E.E. Sheffield Sub-Centre. "Technical and Economic Aspects of the Supply of Reactive Power in England and Wales," by H. J. Sheppard and W. Casson.

Shrewsbury.—New Technical College, London Road. Institution of Production Engineers, Midlands Region. 6.45 p.m. Annual meeting. 7.30 p.m. Film show.

THURSDAY, 30th MARCH

Belfast.—Central Hall, Rosemary Street. A.S.E.E. Northern Ireland Centre. "Some Industrial Applications of Magnetic Power," by T. G. Hawker.

Croydon.—Greyhound Hotel, High Street, 8 p.m. A.S.E.E. South London Branch. "Electricity in the Food Supply Industry," by C. R. Ayling.

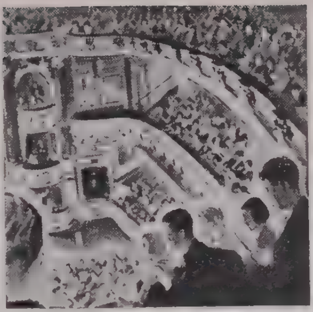
London.—Connaught Rooms, W.C.2, 12.30 for 1 p.m. Batti-Wallahs' Society. Luncheon.

Sheffield.—Grand Hotel, 7.30 p.m. Institution of Plant Engineers, Sheffield and District Branch. "The Role of the Central Engineering Workshop in the Maintenance Problem," by G. C. Oram.

I.E.E. South West Scotland Sub-Centre

Mr. D. Rudd, B.Sc.(Eng.), was unable to present his paper, "A General Theory of Depreciation of Engineering Plant," at last Wednesday's meeting of the South West Scotland Sub-Centre of the Institution of Electrical Engineers, having had to enter hospital. Instead, at short notice, an informal address was given by Mr. C. M. S. Maguire, B.Sc.(Eng.), A.M.I.E.E., on "Glasgow Suburban Railway Electrification."

EMERGENCY LIGHTING—*The new cells have been designed for uses where stand-by electrical power is required. By their very nature they are especially suited to emergency lighting in power stations, sub-stations, theatres, concert halls, hospitals, factories and public buildings of all sorts.*



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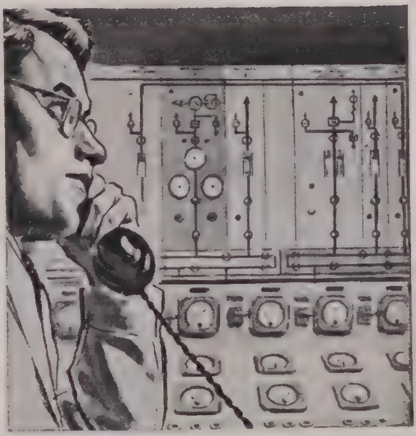

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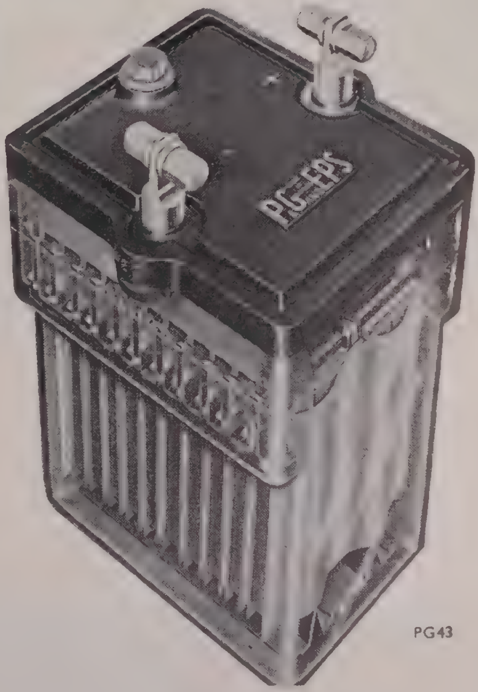

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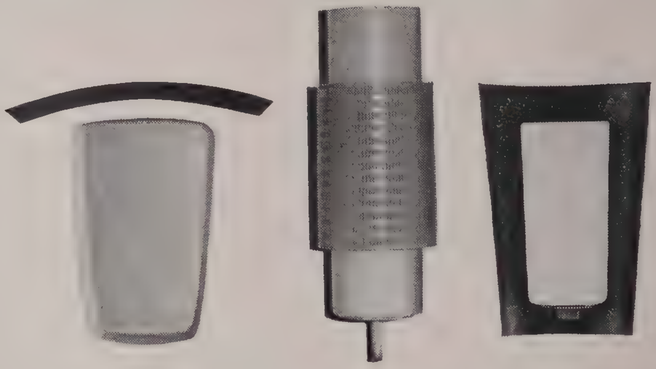

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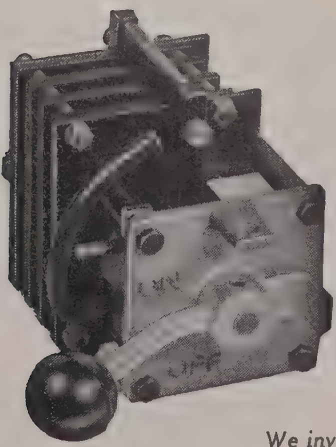

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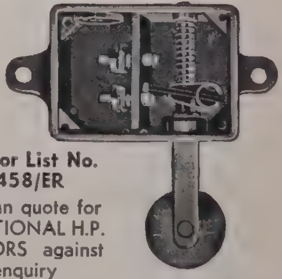

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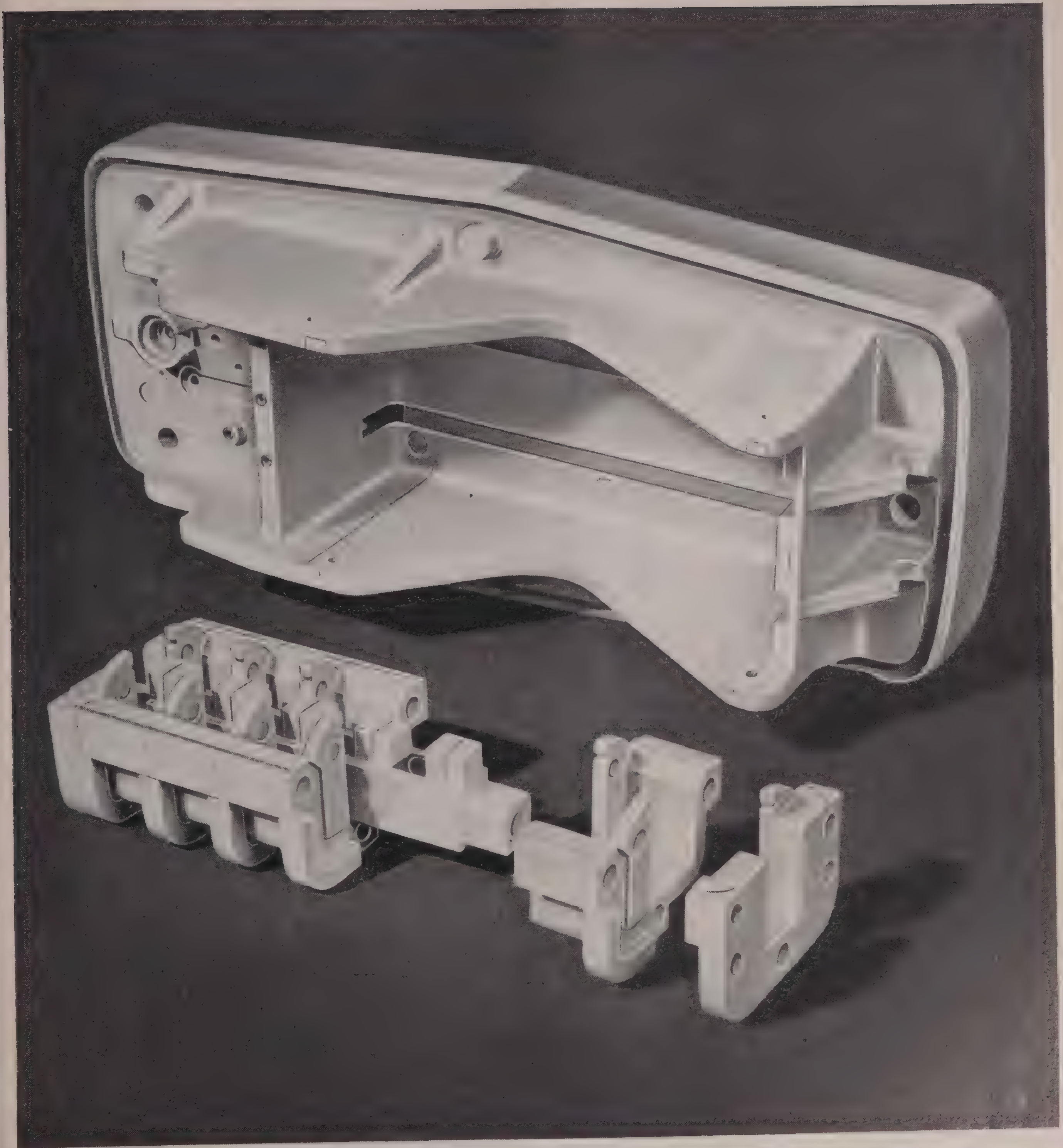

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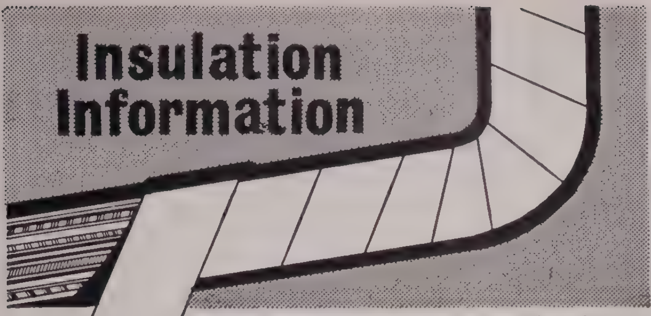

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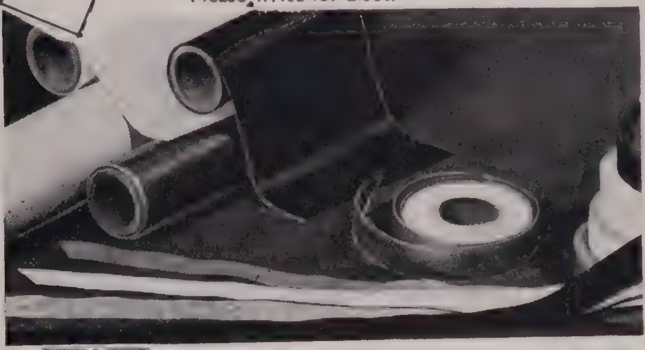

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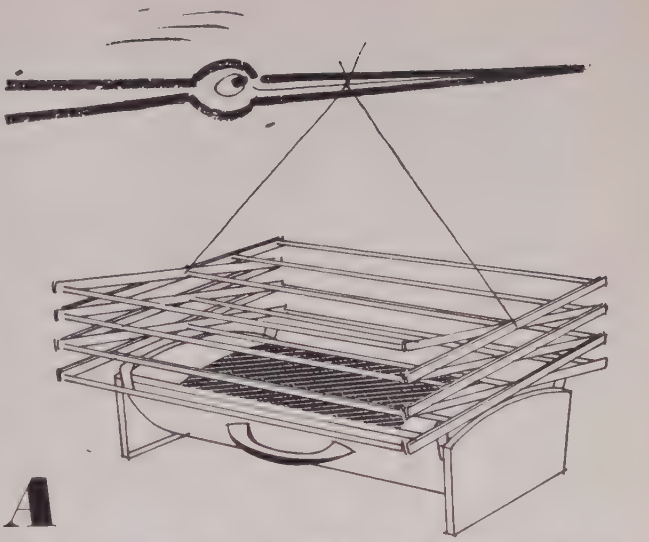

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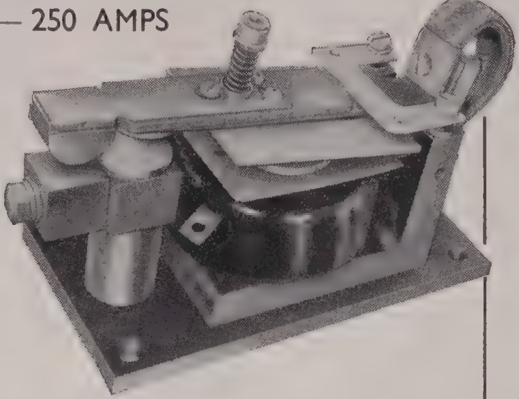

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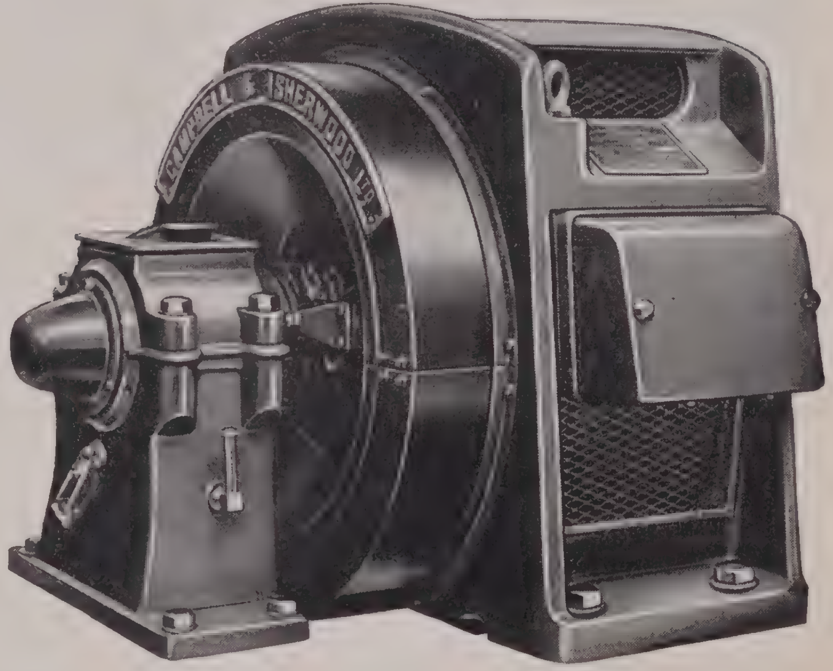

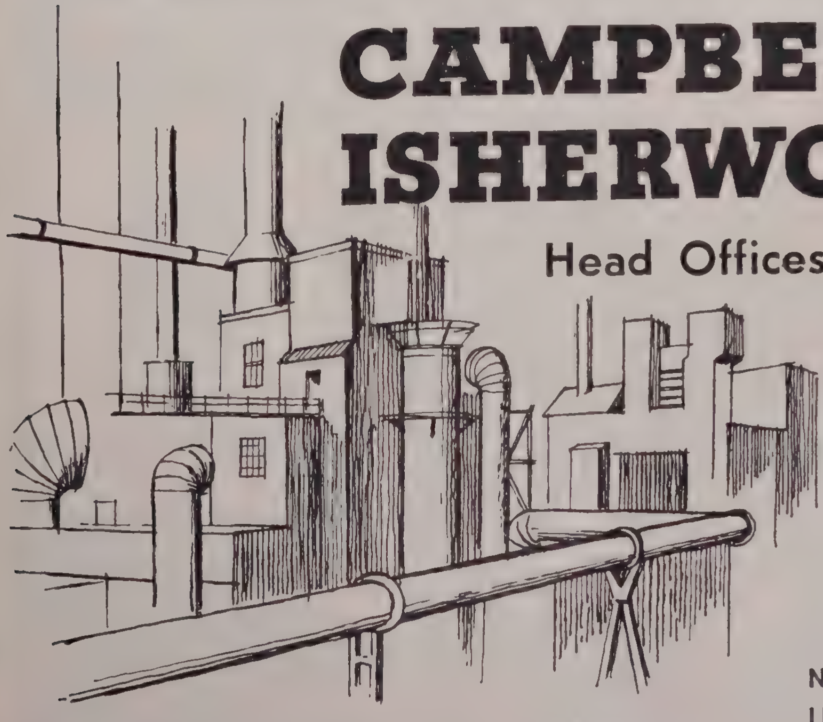

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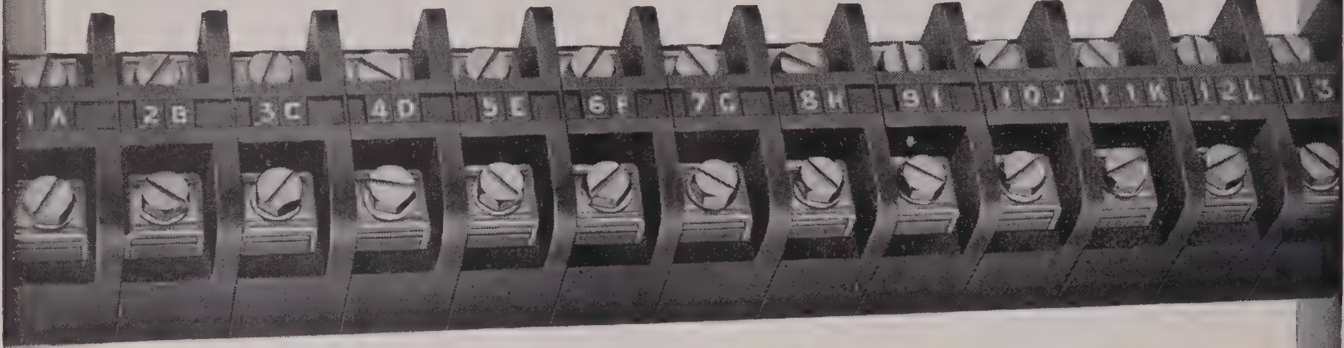
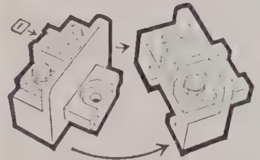


MTE MULTI-LOCK TERMINAL BLOCKS



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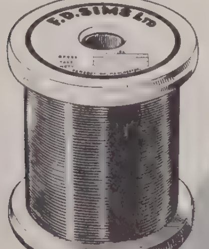

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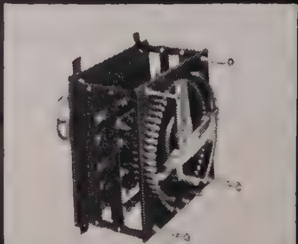

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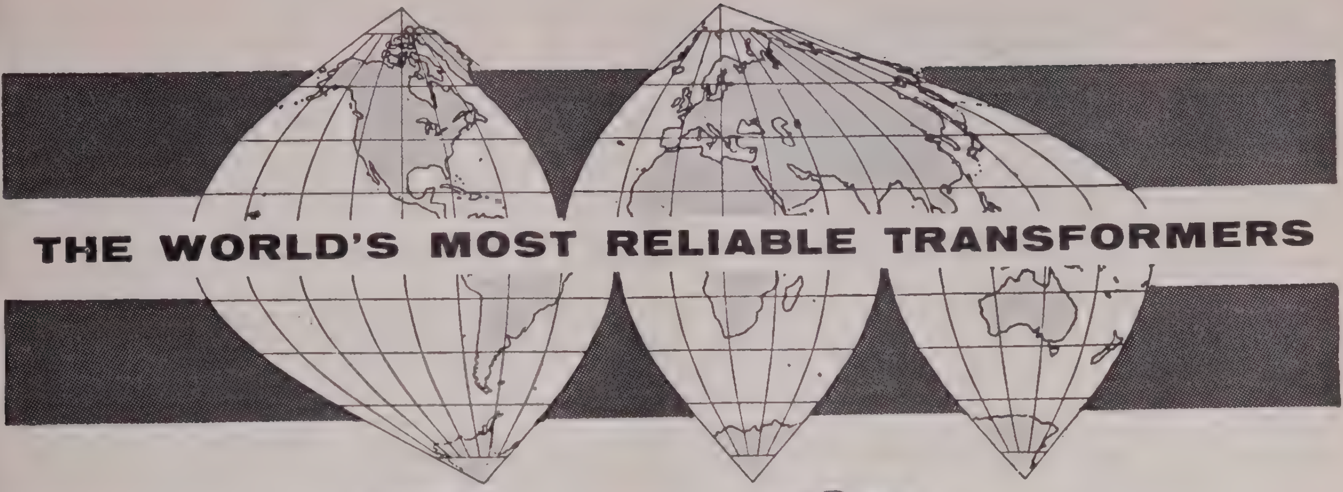

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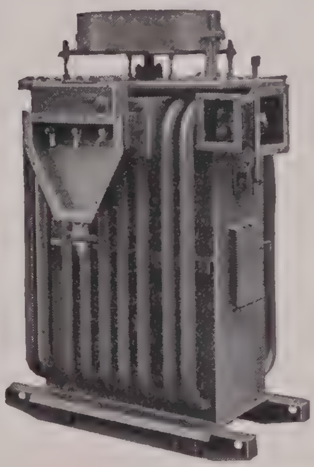

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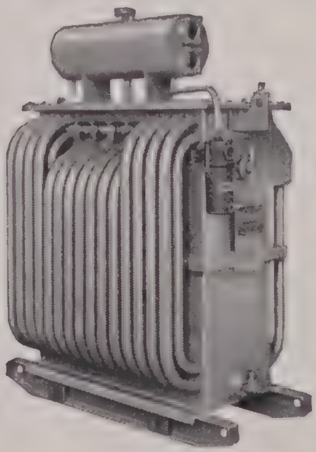

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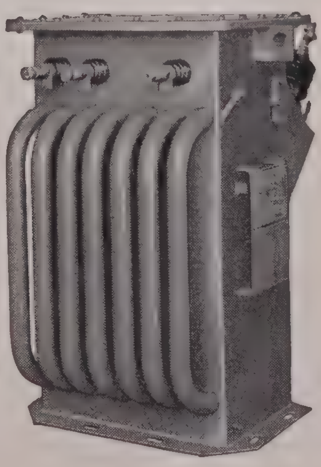

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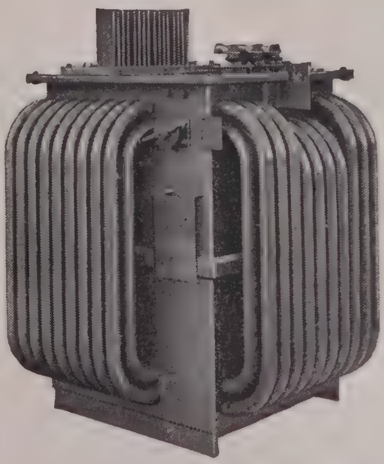

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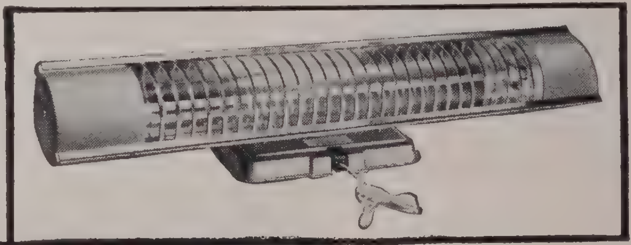

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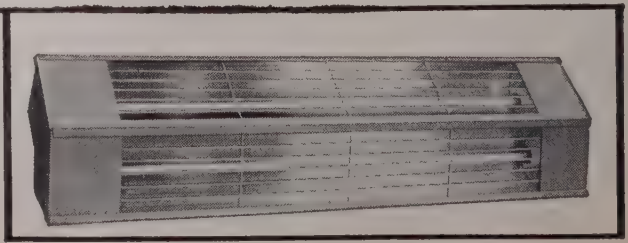

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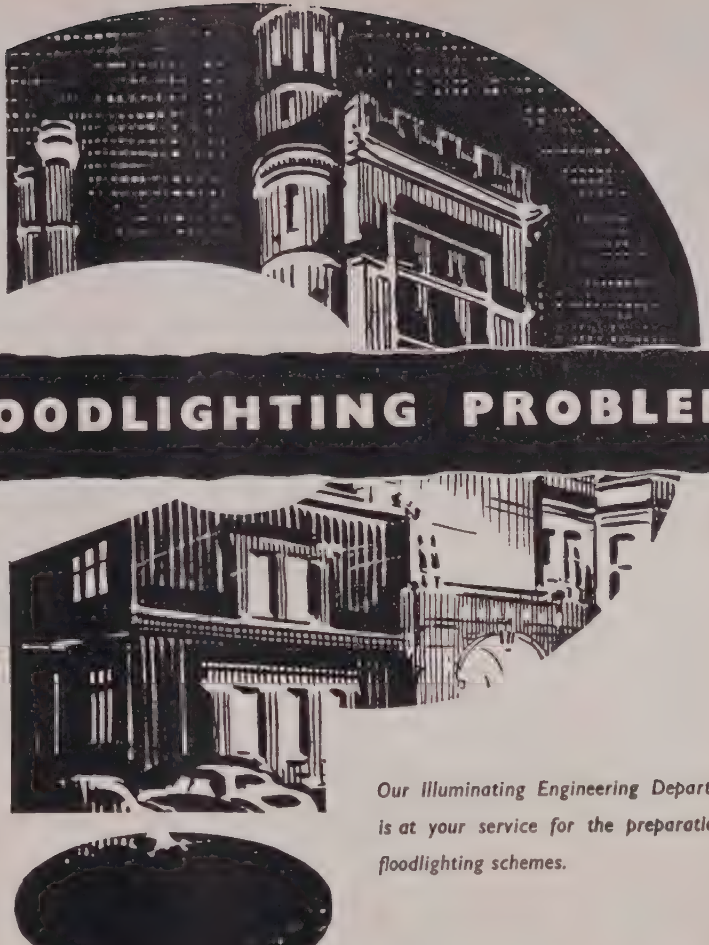

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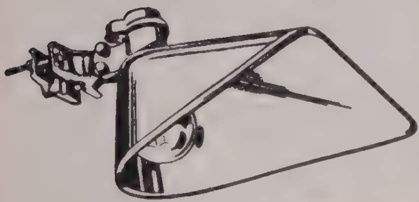
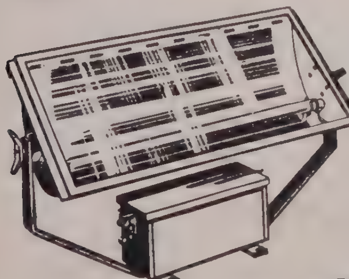
'Realux' Overhead Mounting model, for G.L.S. or M.A./V. lamps.



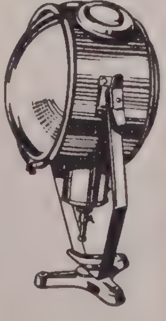
List No. 940
Downward lighting Sodium Lantern for wall or pole mounting.

List No. 775
'Festival' Lanterns for G.L.S. lamps from 100 watt to 1000 watt size.

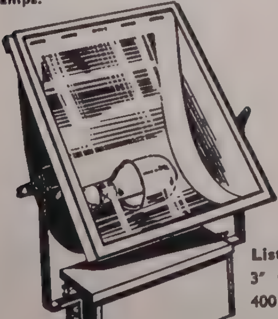
List No. 920
Telescopic Tripod for Floodlantern mounting.



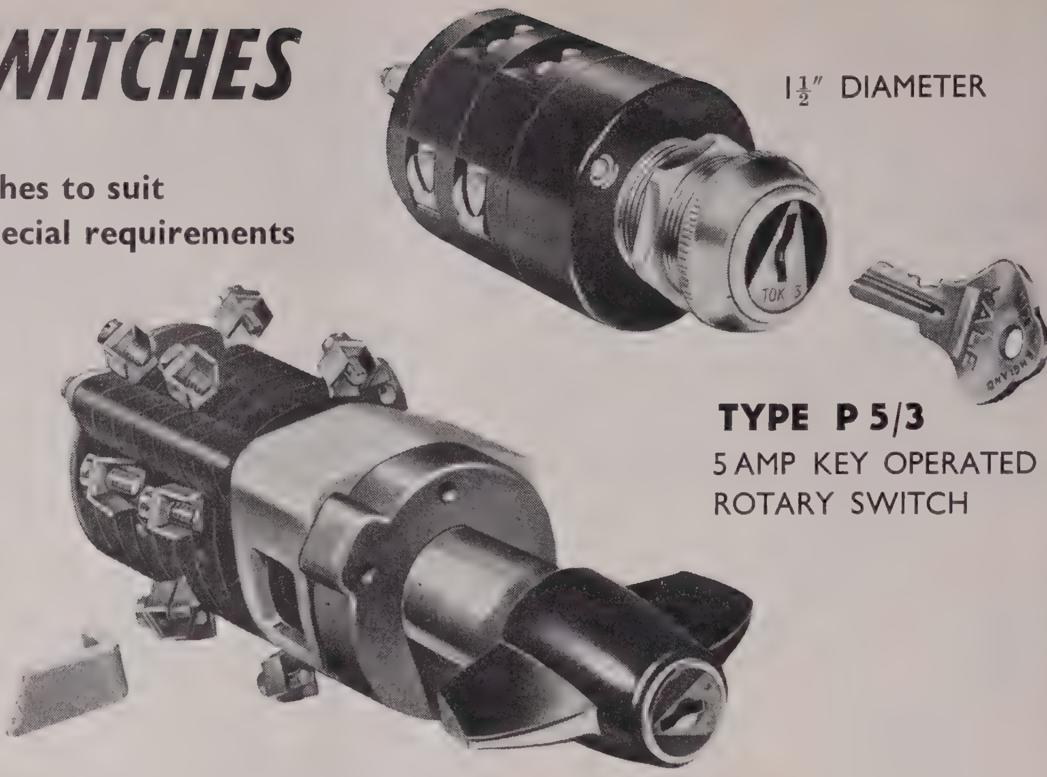
List No. 942
Upward lighting Lantern for 200 watt Sodium lamp.



List No. 556
Narrow beam Projectors for 500 watt to 1,500 watt G.L.S. lamps.



List No. 1231
3" focus Lantern for 400 watt MBF/U lamp.



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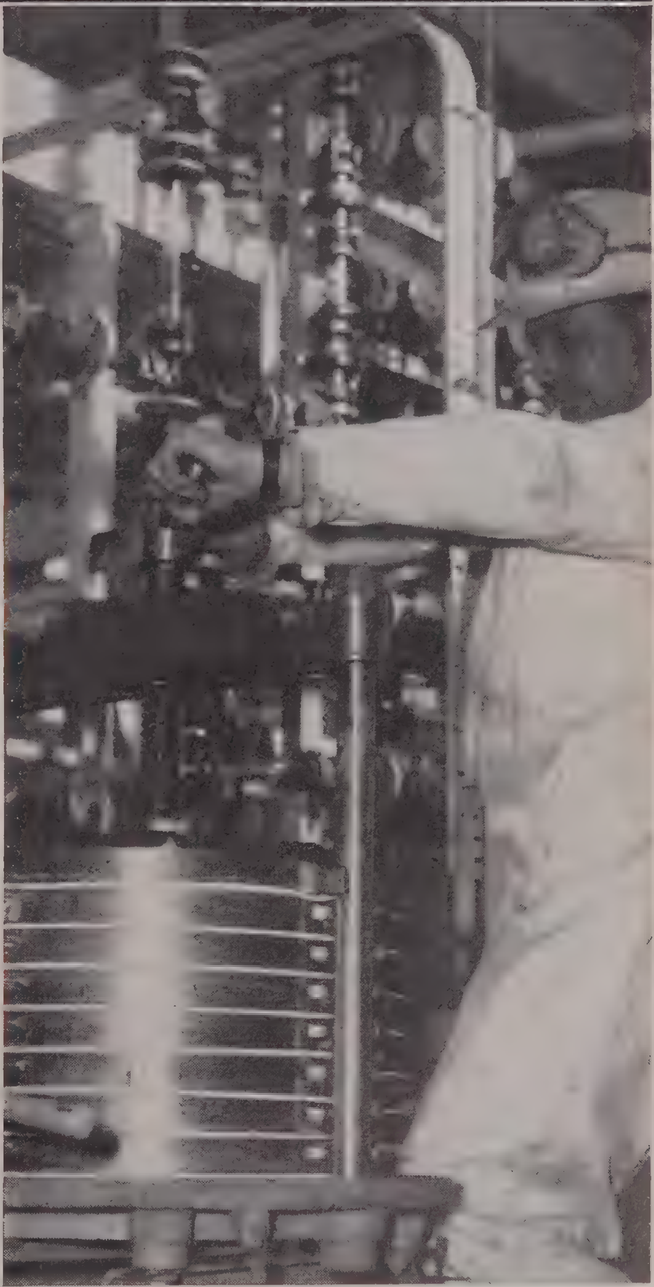

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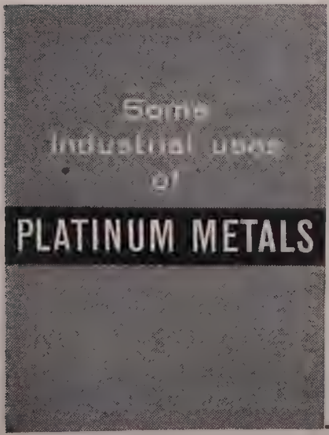

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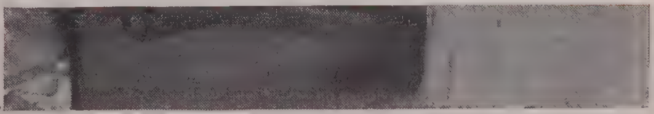

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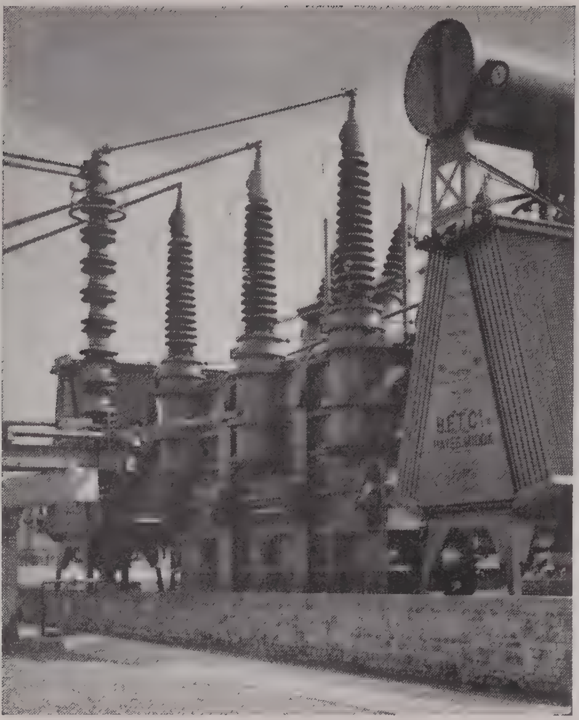
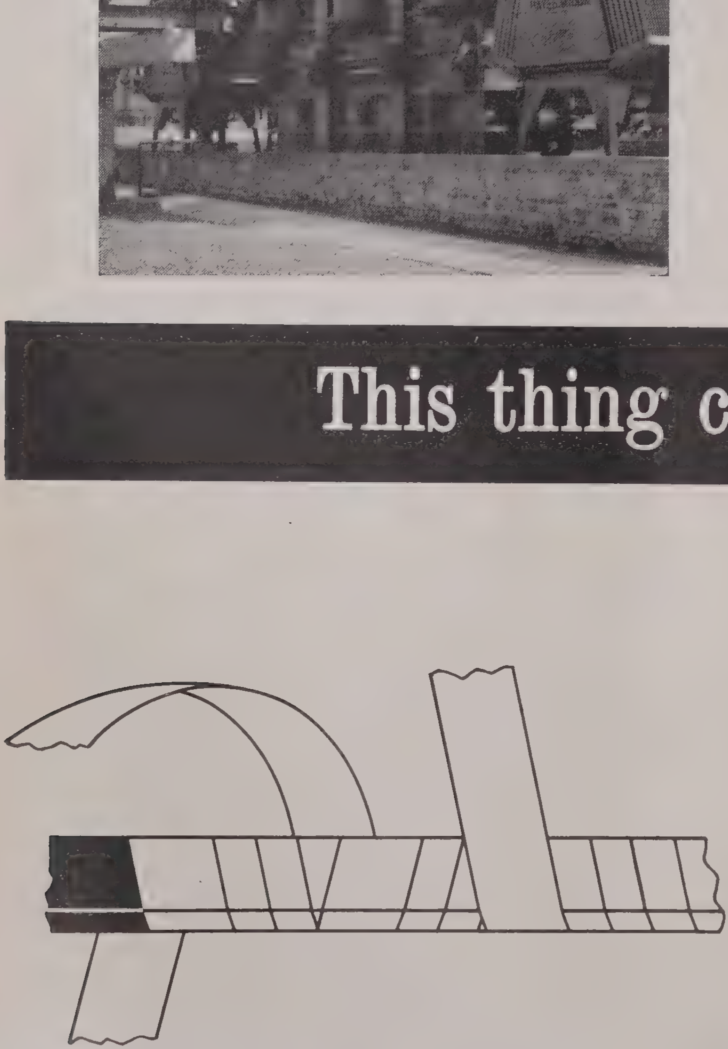


Engineers use the word performance in two senses, a limited one which refers to parameters that can be specified and checked; and a wider, vaguer, but essentially more realistic sense which covers freedom from trouble, ease of servicing, adaptability and many other things. Performance in the first sense is reproducible by any competent manufacturer; it depends on designing to well-established principles. Performance in the second sense is the basis of choice between manufacturers. It comes from countless small differences in design that are based on . . .

This thing called know-how



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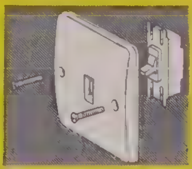

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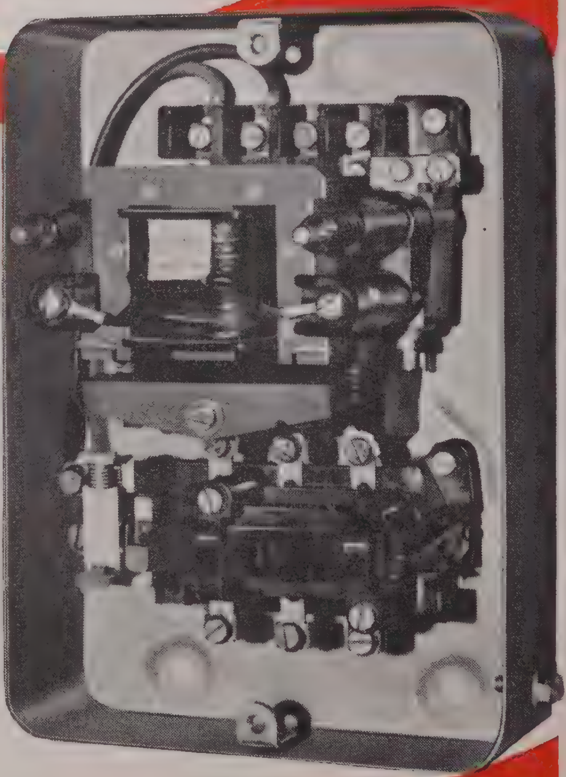

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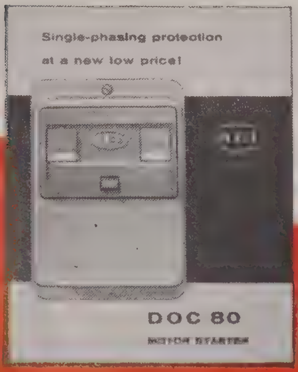

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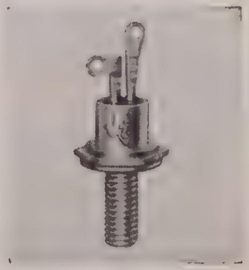

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1S603	300 V						
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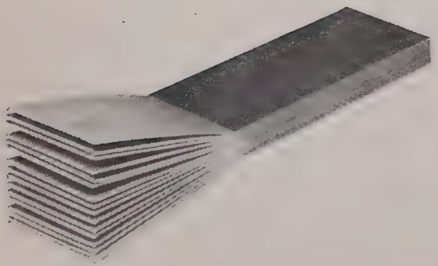

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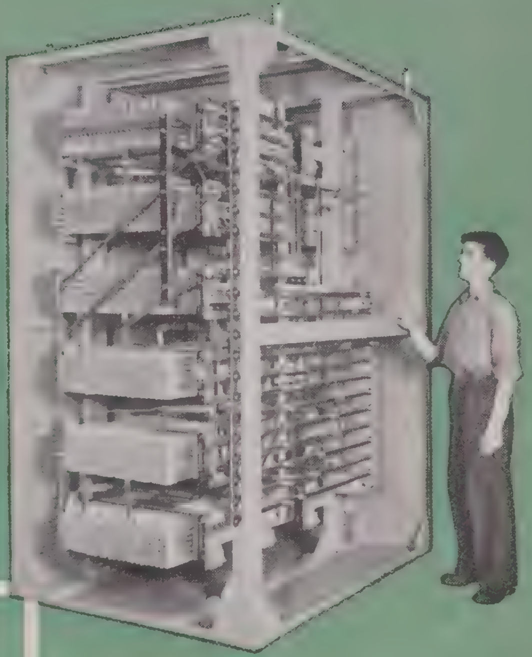

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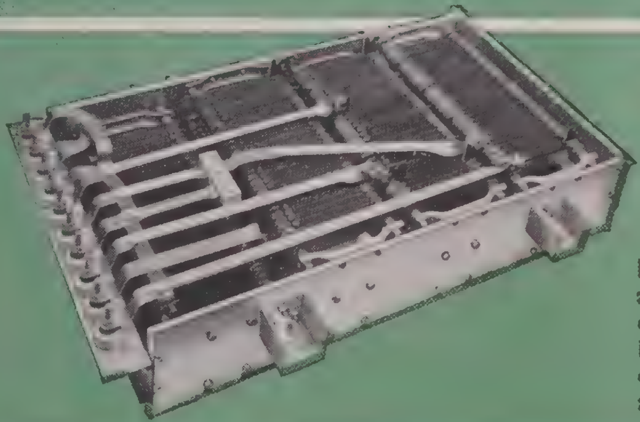

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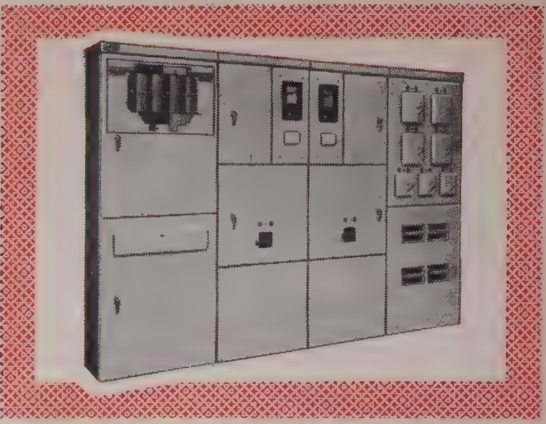

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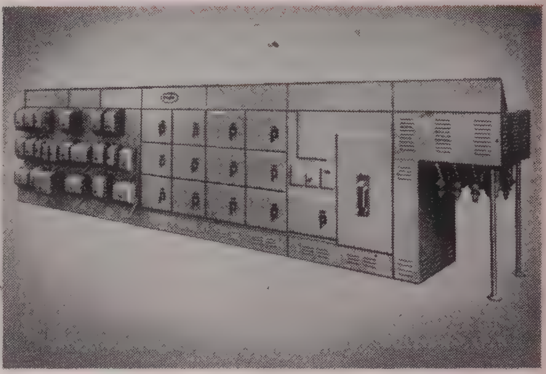

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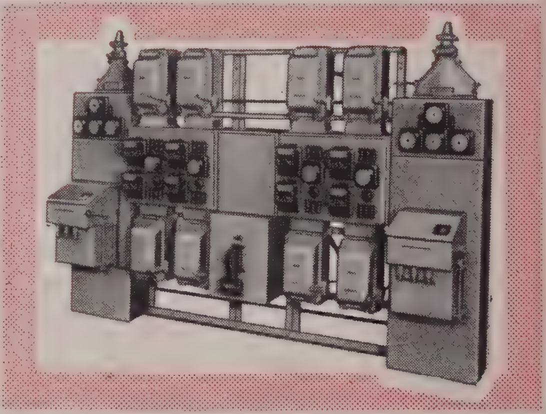

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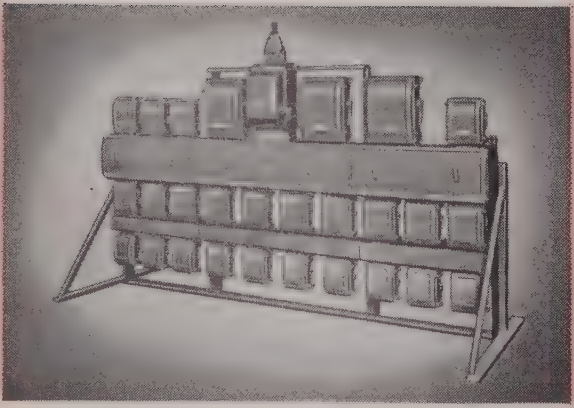

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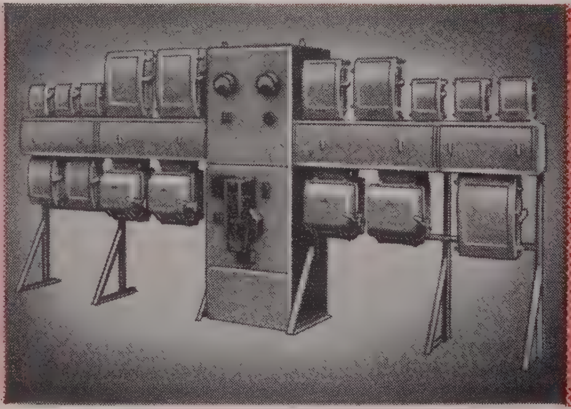

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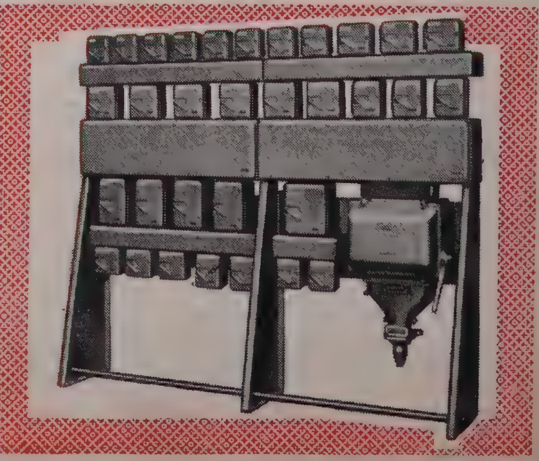

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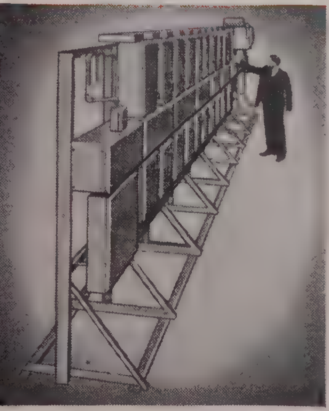

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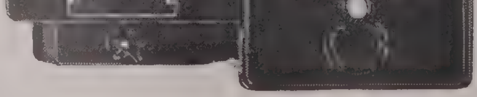

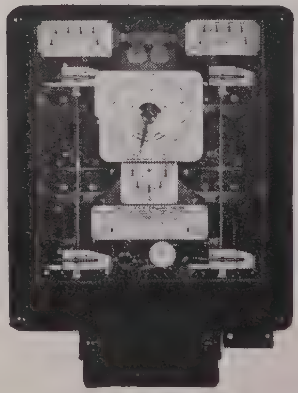

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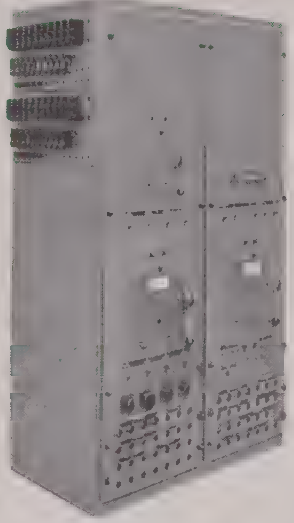
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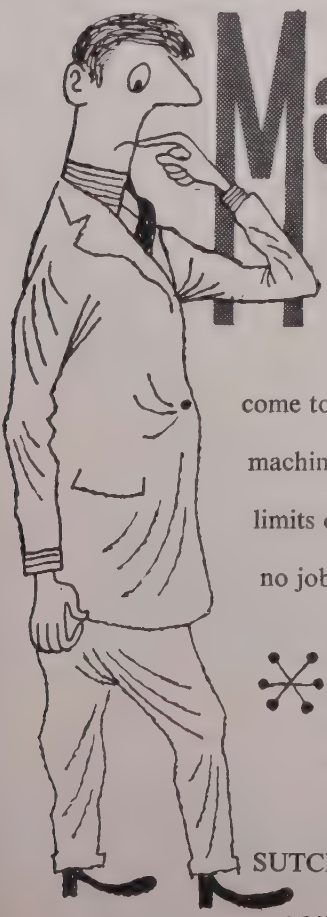

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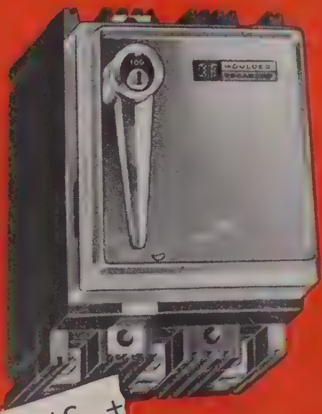

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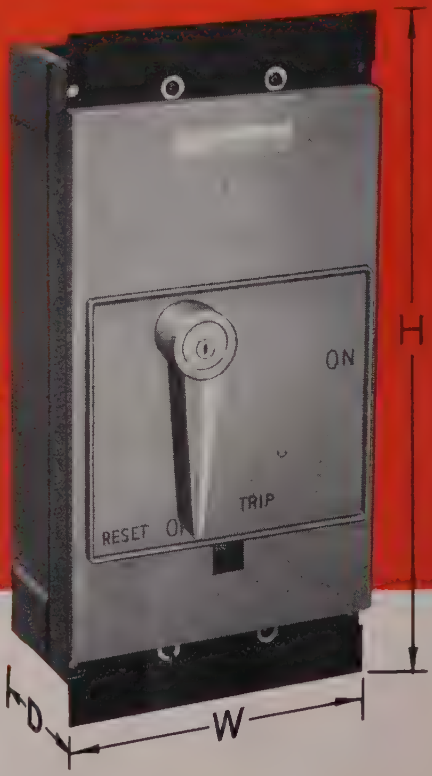

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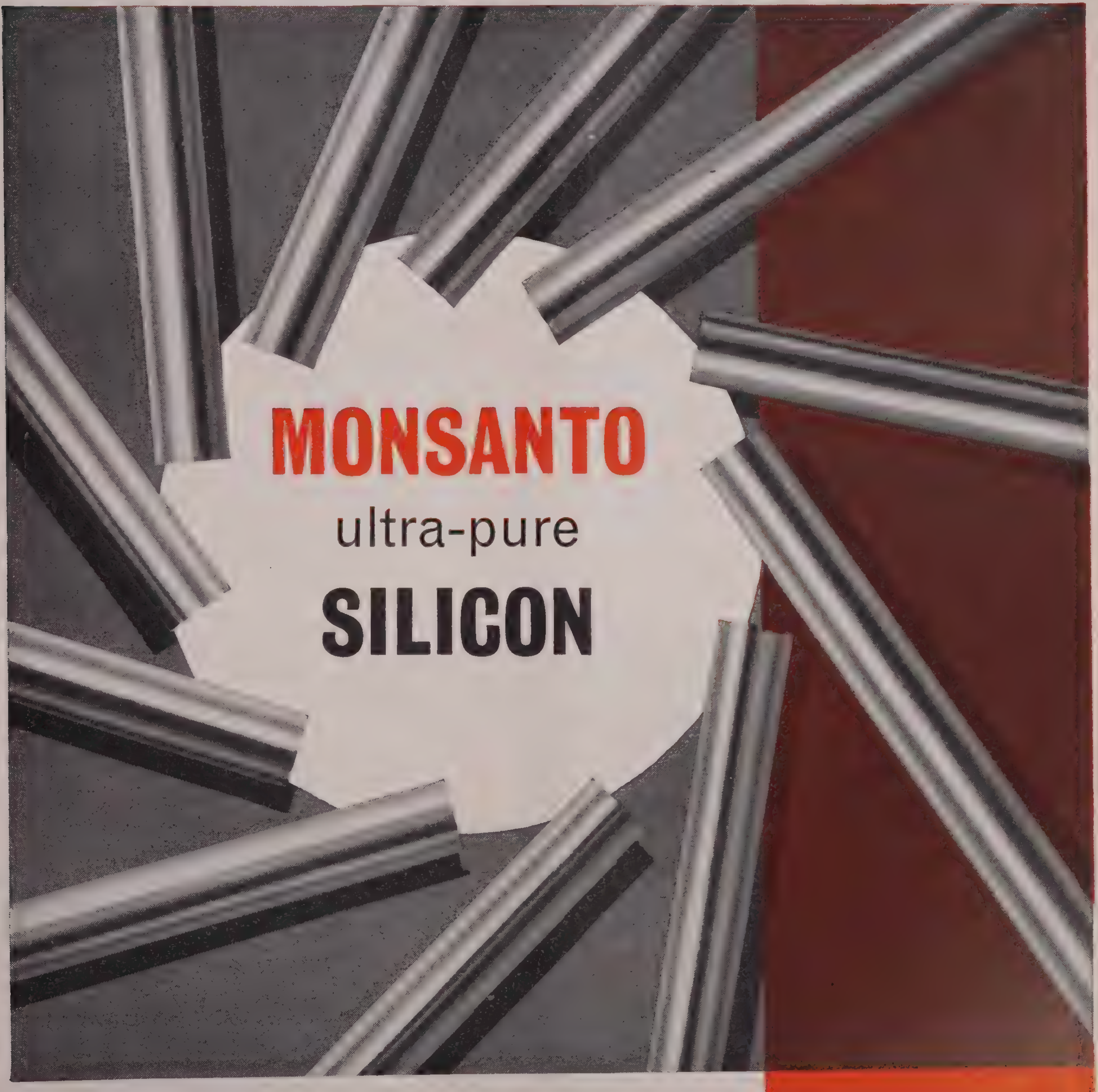

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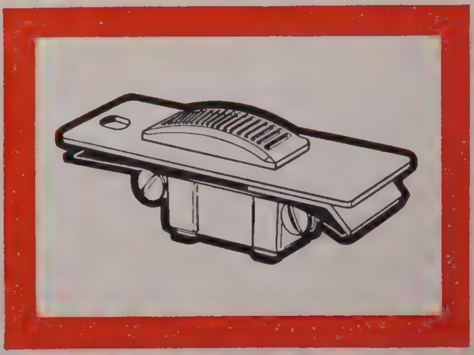

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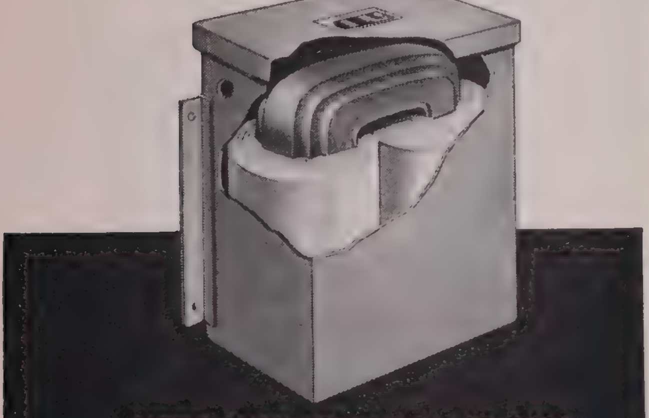

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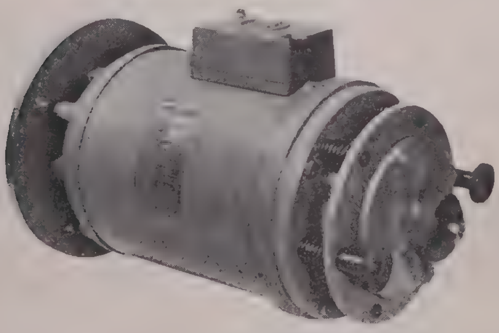

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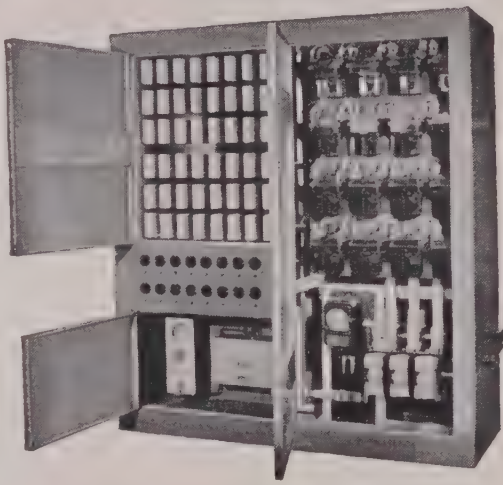

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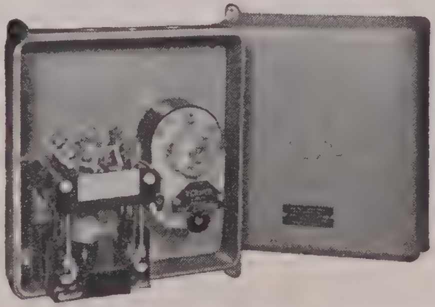

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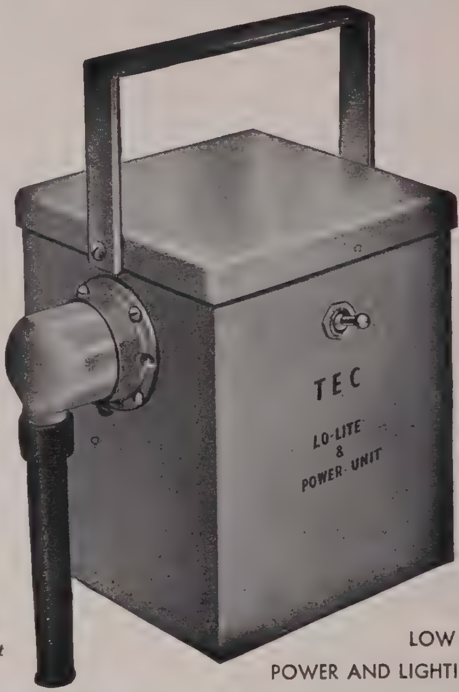

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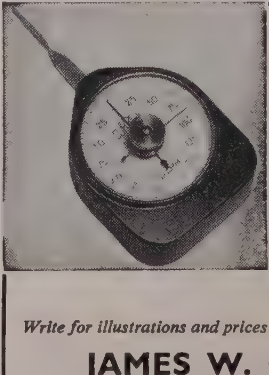

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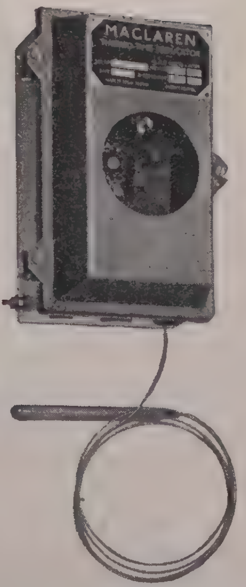

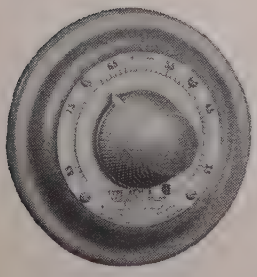

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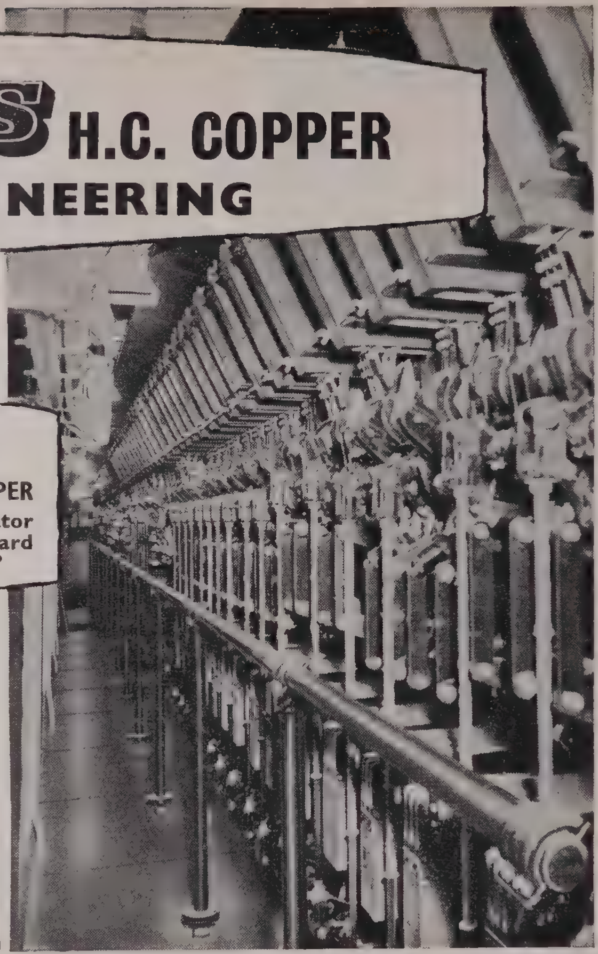

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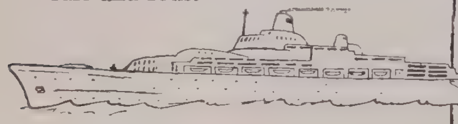

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The photograph on the right shows the rear view of the feeder section of the main switchboard, 6′ in length, manufactured by **Whipp & Bourne Ltd.** For this section and also the generator section, Bolton's supplied 21 tons of h.c. copper.

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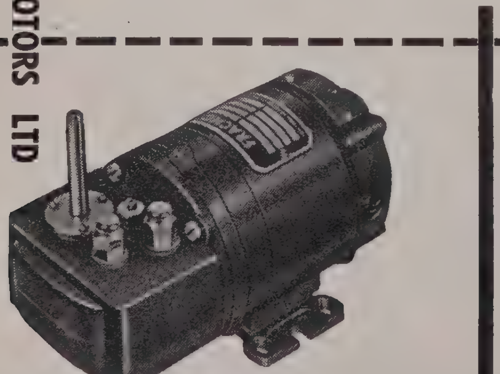

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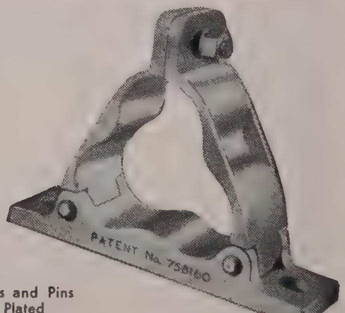

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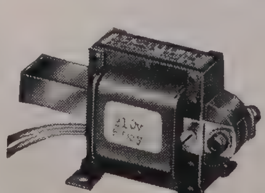

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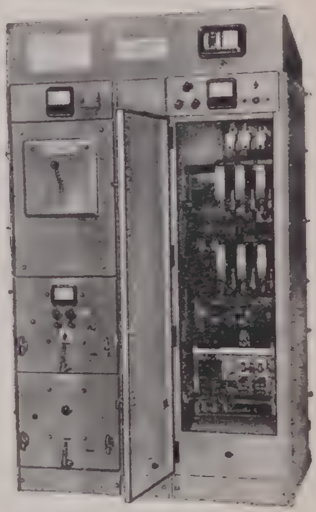

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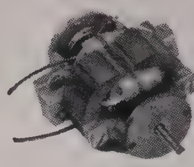

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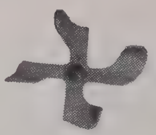

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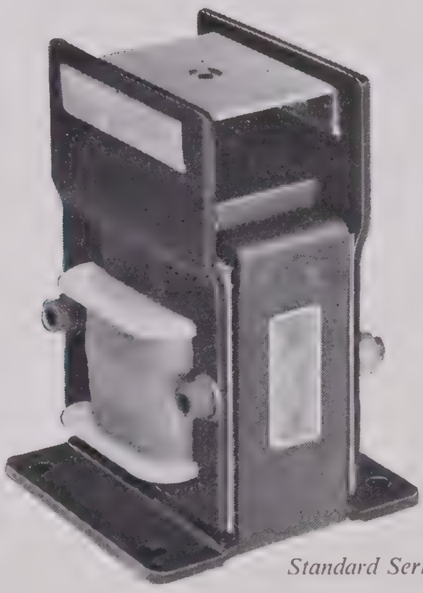

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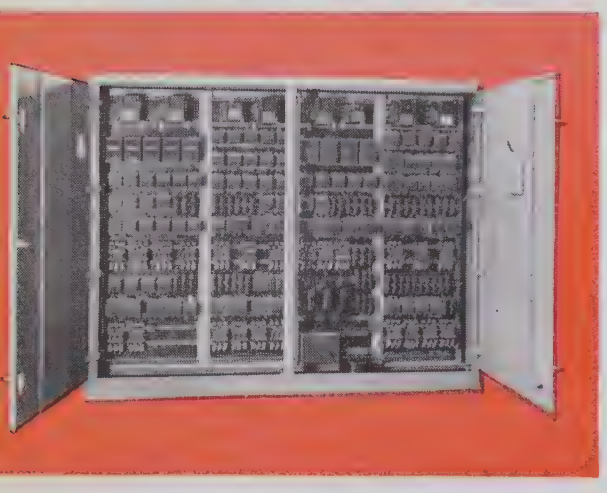

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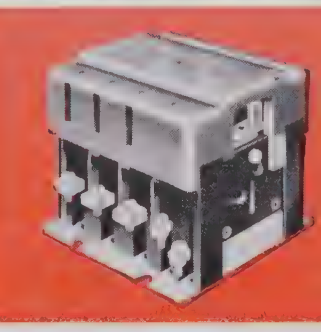
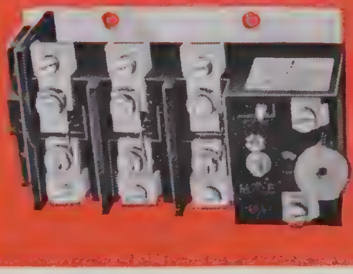
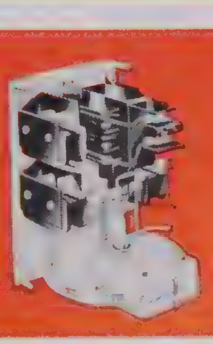


Contactor. 30 Amp, Type UC2



Overload Relay, Thermal, Type UOL11



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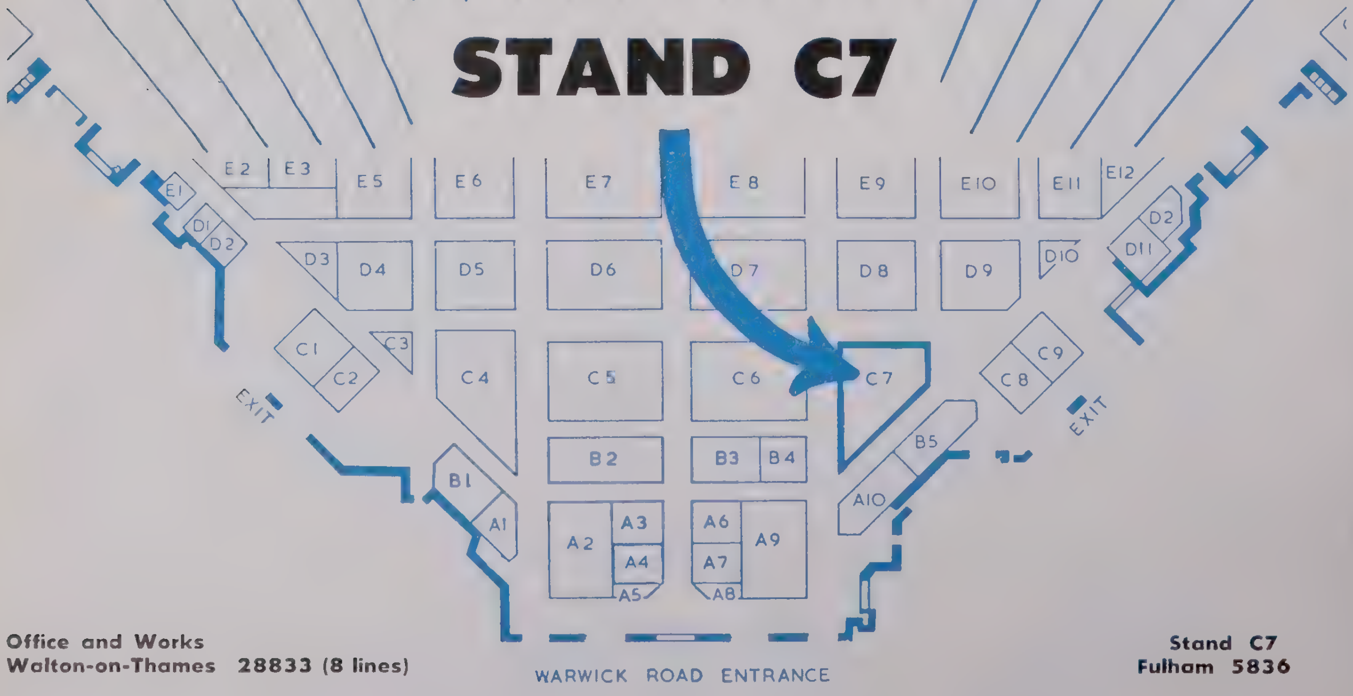

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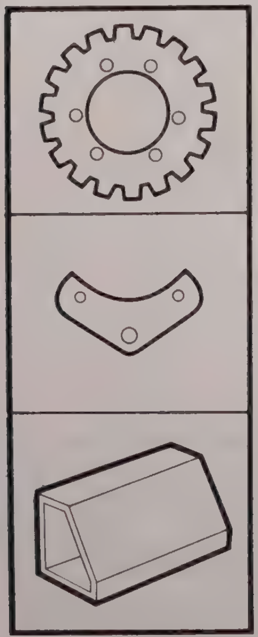

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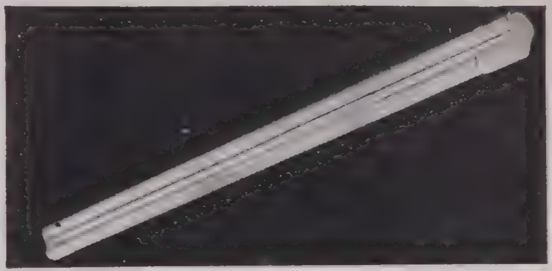

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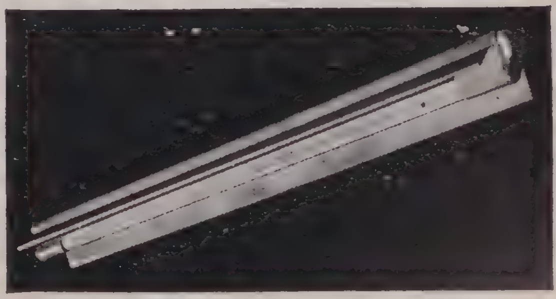

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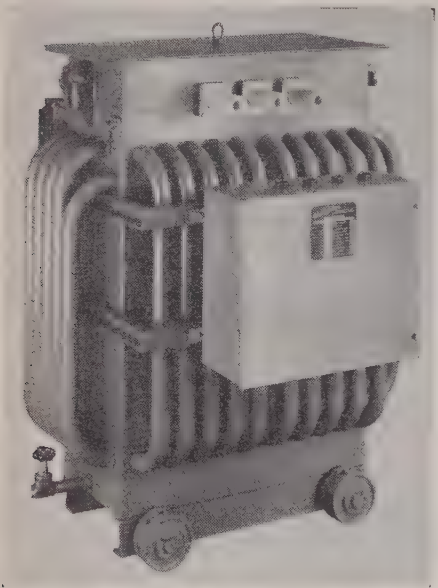

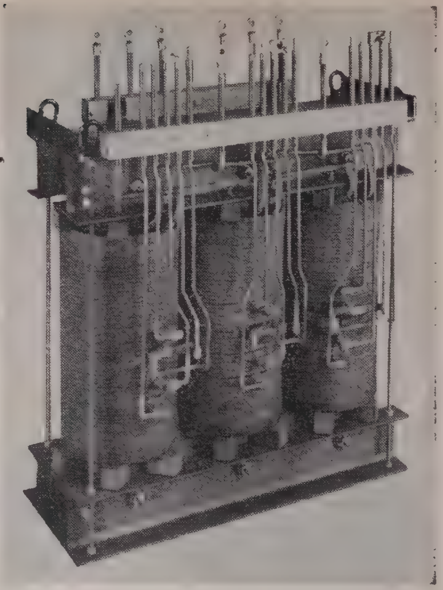

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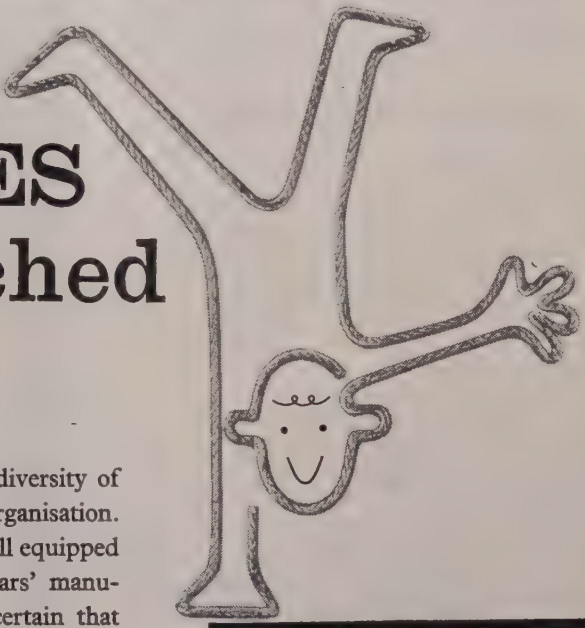

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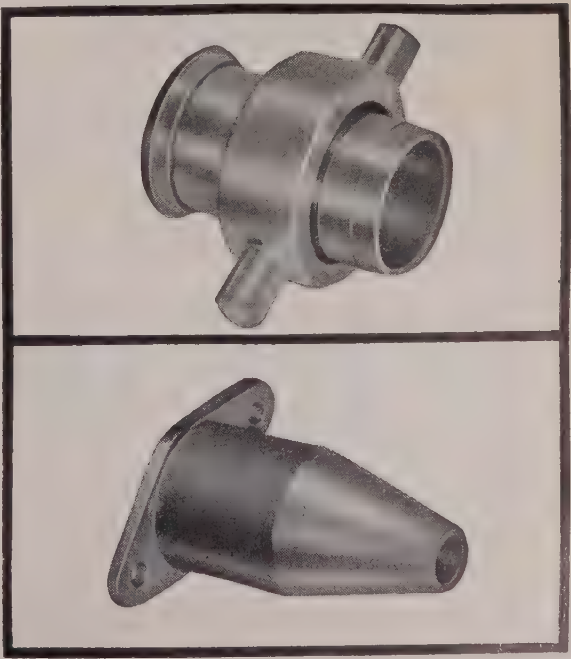

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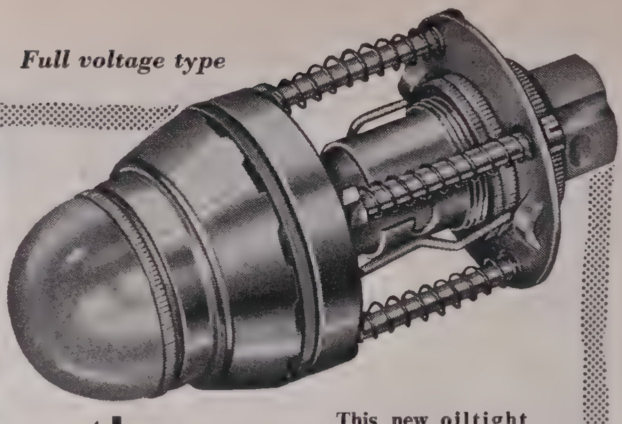

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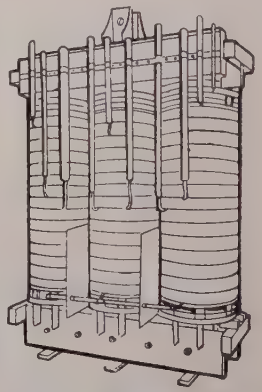

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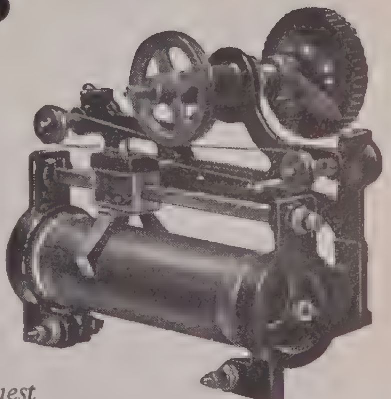

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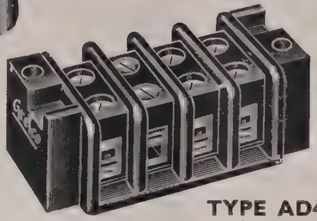

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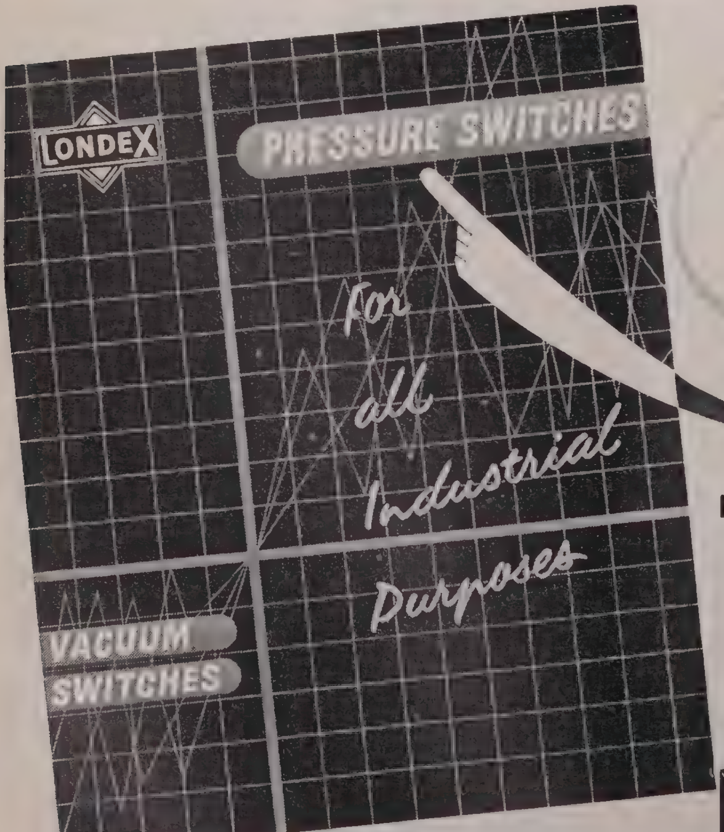

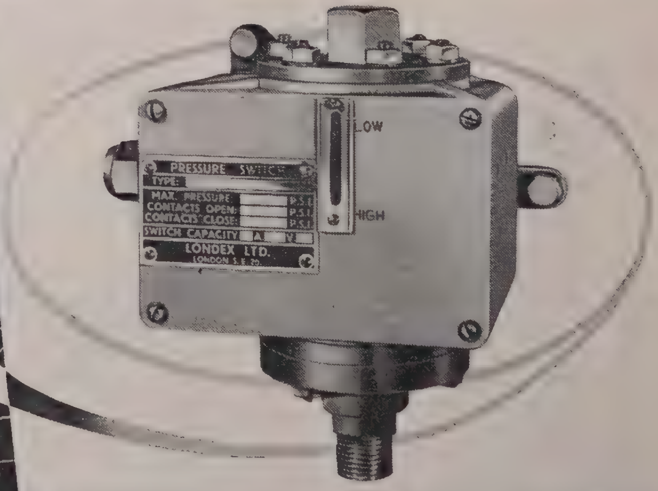

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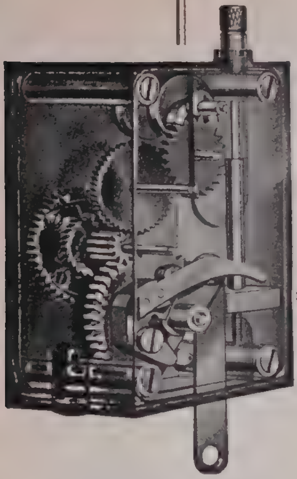

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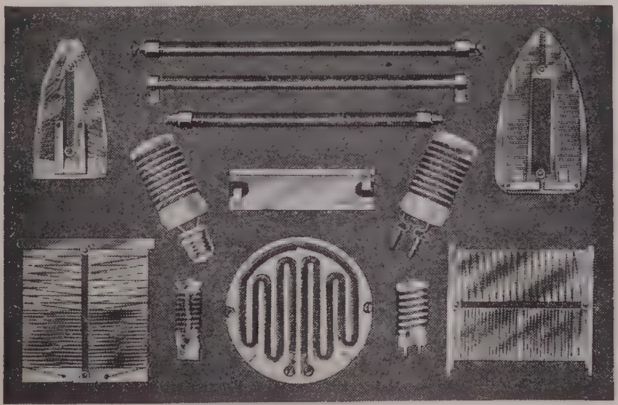

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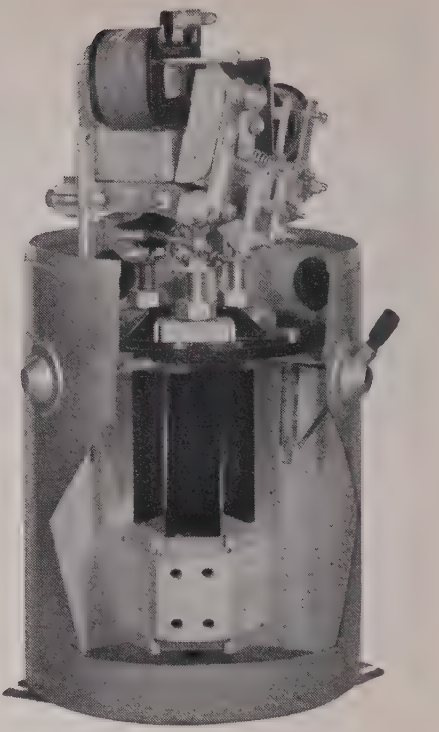

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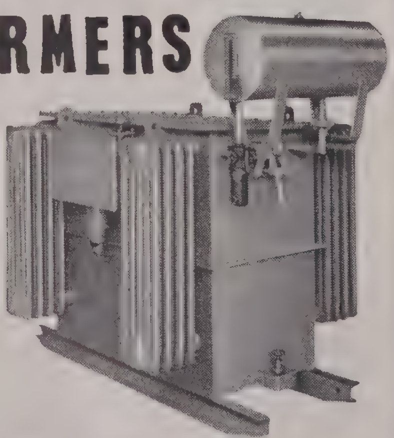

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Telephone 27-1437

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 4/- per line (approx. 6 words).

DISPLAYED CLASSIFIED:—53/- per single column inch.

Where an advertisement includes a Box Number there is an additional charge of 1/-.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

Remittances payable to "ELECTRICAL REVIEW."

REPLIES TO BOX NUMBERS should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. If an applicant for a situation appearing under a Box Number does not wish his reply to be forwarded to a particular firm or individual, instructions to this effect should be addressed to the Advertisement Supervisor, ELECTRICAL REVIEW. The name of an advertiser using a Box Number cannot be disclosed.

OFFICIAL NOTICES, TENDERS, ETC.

STAFFORDSHIRE COUNTY COUNCIL EDUCATION COMMITTEE

Stafford College of Technology

TENDERS are invited for :—

(a) Demonstration electrical equipment for electrical laboratories.

(b) Major items of apparatus for chemical laboratory.

(c) X-ray apparatus for nucleonic block.

Forms of tender may be obtained from the Director of Education (Supplies), County Education Offices, Earl Street, Stafford.

Completed tenders enclosed in the envelope provided must be received by the undersigned at County Buildings, Martin Street, Stafford, not later than noon, Saturday, 29th April, 1961.

T. H. EVANS,
Clerk of the County Council.
8143

COUNTY BOROUGH OF BOURNEMOUTH

Borough Engineer's Department

Street Lighting Equipment

TENDERS are invited for the supply of equipment for 260 Group A and 2,800 Group B lighting units, including 1,200 special brackets and spigot boxes for conversion of gas columns.

Specification obtainable from Borough Engineer, Town Hall, Bournemouth.

Tenders to reach me by 9 a.m. on 8th April, 1961.

A. LINDSAY CLEGG,
Town Clerk.
8158

DURHAM COUNTY COUNCIL

TENDERS invited:—

Seaham Harbour Grammar Technical School: Electrical Installation.

Staindrop New Modern School: Electrical Installation.

Application for further details to County Architect, South Street, Durham, not later than 5th April, 1961.

J. K. HOPE,
Clerk of the County Council.
Shire Hall, Durham. 8159

SITUATIONS VACANT

(See "Replies to Box Numbers" above)

EAST MIDLANDS ELECTRICITY BOARD

Area Board Headquarters

SENIOR ASSISTANT (Purchasing).
(Vacancy No. 29/61).

Salary N.J.C. Grade 5, £1,020 × £30 to £1,140 per annum.

Candidates should have experience of modern purchasing procedures and the sale of redundant equipment and scrap. A knowledge of the types of materials, plant, equipment and domestic apparatus, etc., purchased by the Board is essential.

Applications should be addressed to the Secretary, East Midlands Electricity Board, Mapperley Hall, Lucknow Avenue, Nottingham, within fourteen days of the date of this advertisement, in an envelope endorsed "Senior Assistant (Purchasing)." 8161

AIR MINISTRY

require STATION ENGINEERS (G.D.) Grade III at R.A.F. and Ministry of Aviation stations throughout the United Kingdom. The work consists of installation, operation and maintenance of high and medium-voltage electrical distribution systems, electrical power and lighting installations, control systems and generating plant; knowledge of heating and ventilating plant and diesel engines an advantage.

SALARY, which is dependent upon age, quals. and exp., ranges from £776 (age 25) to £961 max. in Grade III. There are pension prospects and also opportunities of advancement to numerous posts in the higher grades, viz.:—

Technical Grade II :
£961 - £1,098 (276 posts).
Inspector of Works Grade I :
£1,098 - £1,348 (137 posts).
Technical Grade B :
£1,348 - £1,552 (25 posts).
Technical Grade A :
£1,439 - £1,697 (17 posts).

Vacancies occurring in the higher grades are, as a rule, filled by promotion of existing staff.

Overseas tours for which special allowances ranging at present up to £1,800 p.a. are payable in addition to a higher salary. Internal training courses are provided and financial assistance and time off is allowed for recognised courses of study leading to higher quals. 5-day week with 18 days' paid leave a year initially.

Quals.: Applicants, who must be natural-born British subjects, up to age 55, should hold O.N.C. Elect. or C. and G. Electrical Technician's Cert. or equiv., and must also have had recognised apprenticeship with firm of good repute plus 3 years' employment in electrical engineering, preferably on operation and maintenance of mine, factory or workshops plant and services. Preference to candidates with supervisory experience.

Forms from Manager (PE.1), Ministry of Labour, Professional and Executive Register, Atlantic House, Farringdon Street, London, E.C.4. Candidates selected will normally be interviewed in London and certain expenses reimbursed. Only applicants selected for interview will be advised. 249

HIGGS MOTORS LTD.
WITTON
BIRMINGHAM 6
REQUIRE

CHIEF ELECTRIC MOTOR DESIGNER

★

FIRST-CLASS MAN CAPABLE OF EARNING TOP EXECUTIVE SALARY

8052

EASTER

ADVERTISEMENTS for the issue of 31st March have now closed for press

Advertisements for 7th April are accepted up to Wednesday, 29th March

All communications to be addressed to:
Classified Advertisement Department,
ELECTRICAL REVIEW
Dorset House, Stamford Street
London, S.E.1

Original testimonials should not be sent with applications for employment

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointments in the Electrical Department at Divisional Headquarters, Cockfosters (North London).

THIRD ASSISTANT ENGINEER
(Metering)
(S.V. No. 1459).

Salary N.J.B. Class AX, Grade 8, Scale 10, £1,105-£1,325 per annum plus London weighting £50 per annum.

The duties of the successful applicant will be to assist in the general duties of the Metering Section, and in the design of and the preparation and details for the specifications for new bulk supply and operational metering equipments.

In addition to assist in the preparatory and associated duties in connection with individual and general modifications to existing metering equipments and in the installation and testing of new and special electrical measuring devices.

Applicants should have the Higher National Certificate in Electrical Engineering or equivalent qualifications, and should have practical experience with bulk supply metering equipments using electro-mechanical summation.

FOURTH ASSISTANT ENGINEER
(Metering)
(S.V. No. 1460).

Salary N.J.B. Class AX, Grade 11, Scale 7, £855-£1,090 per annum plus London weighting £50 per annum.

Applicants should have had experience either in the testing and calibration of electrical indicating and recording instruments, or of polyphase metering equipment. The duties would be interesting and varied, including the testing of instrument transformers, central indication originating equipment and participation in field tests such as turbo-alternator and boiler acceptance tests.

Applicants should possess preferably the Higher National Certificate in Electrical Engineering or equivalent qualification.

Applications, quoting the appropriate Reference S.V. No., stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., by 1st April, 1961. 8131

ELECTRICAL ENGINEERING DRAUGHTSMEN

NATIONAL COAL BOARD require SENIOR ENGINEERING and ENGINEERING DRAUGHTSMEN for their No. 3 (Rhondda) Area.

Applicants should have experience in the preparation of electrical circuit and layout drawings and heavy plant.

Salary ranges are either £855 to £1,130 per annum (for Senior Engineering Draughtsmen; H.N.C. or equivalent desirable) or £785-£910 per annum (for Engineering Draughtsmen; O.N.C. desirable).

Applications (quoting 165/43) to the Area Staff Manager, No. 3 Area, National Coal Board, Llwyncelyn Offices, Porth, Glam., by 1st April, 1961. 8141

***Situations Vacant** (continued)*

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

STATION SHIFT CONTROL ENGINEER, WARWICK POWER STATION
(Vacancy No. 45/61).

Applications are invited for the position of STATION SHIFT CONTROL ENGINEER at Warwick Power Station, Emscote Road, Warwick.

Candidates should be suitably qualified and have had experience in the control room.

Salary will be in accordance with Class E, Grade 10 (£765-£870 per annum) of the National Joint Board Agreement, plus £90 per annum allowance for shift duties.

Closing date for receipt of applications, 31st March, 1961.

ASSISTANT ENGINEER (RELIEF), WILLINGTON "A" POWER STATION
(Vacancy No. 46/61).

Applications are invited for the position of ASSISTANT ENGINEER (Relief) at Willington "A" Power Station, P.O. Box 27, Derby.

Applicants should have received a sound electrical training and have had experience in the operation and control of modern high pressure boiler and turbine plant. Preference will be given to candidates who possess the Higher National Certificate in Mechanical or Electrical Engineering or its equivalent.

Salary will be in accordance with Class L, Grade 12 (£1,040 -£1,165 per annum) of the National Joint Board Agreement, plus 10% allowance whilst engaged on shift duties.

Closing date for receipt of applications, 31st March, 1961.

ASSISTANT COAL AND ASH HANDLING ENGINEER HIGH MARNHAM POWER STATION
(Vacancy No. 47/61).

Applications are invited for the position of ASSISTANT COAL AND ASH HANDLING ENGINEER at High Marnham Power Station, Near Newark, Notts.

Candidates should have knowledge of handling rail borne coal supplies and the operation of ash handling and disposal plant.

Salary will be in accordance with Class N, Grade 10 (£1,350-£1,500 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 31st March, 1961.

ASSISTANT ENGINEERS (Relief), DRAKELOW "A" POWER STATION
(Vacancy No. 50/61).

Applications are invited for the positions of ASSISTANT ENGINEERS (Relief) at Drakelow Power Station, near Burton-on-Trent, Staffs.

Applicants should have received a sound electrical training and have had experience in the operation and control of modern high-pressure boiler and turbine plant. Preference will be given to candidates who possess the Higher National Certificate in Mechanical or Electrical Engineering or its equivalent.

Salary will be in accordance with Class J, Grade 12 (£890 - £1,015 per annum) of the National Joint Board Agreement, plus 10% allowance whilst engaged on shift duties.

Closing date for receipt of applications, 7th April, 1961.

ASSISTANT PLANNING ENGINEER, DRAKELOW "A" AND "B" POWER STATIONS
(Vacancy No. 51/61).

Applications are invited for the position of PLANNING ENGINEER at Drakelow "A" and "B" Power Stations, near Burton-on-Trent, Staffs.

Applicants should have held a position of responsibility in a modern power station and should have received a thorough practical and theoretical training.

Preference will be given to candidates who are corporate members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 8 (£1,440 - £1,610 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 7th April, 1961.

ASSISTANT ENGINEERS (Relief), LINCOLN POWER STATION
(Vacancy No. 52/61).

Applications are invited for the positions of ASSISTANT ENGINEERS (Relief) at Lincoln Power Station, Spa Road, Lincoln.

Applicants should have received a sound electrical training and have had experience in the operation of boiler and turbine plant. Preference will be given to candidates who possess the Higher National Certificate in Mechanical or Electrical Engineering, or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class F, Grade 12 (£715 - £805 per annum) of the National Joint Board Agreement, plus £90 per annum allowance whilst engaged on shift duties.

Closing date for receipt of applications, 7th April, 1961.

ASSISTANT ENGINEER (Relief), DERBY POWER STATION
(Vacancy No. 53/61).

Applications are invited for the position of ASSISTANT ENGINEER (Relief) at Derby Power Station, Full Street, Derby.

Applicants should have received a sound technical training and have had experience in the operation of boiler and turbine plant. Preference will be given to candidates who possess the Higher National Certificate in Mechanical or Electrical Engineering, or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class F, Grade 12 (£715 - £805 per annum) of the National Joint Board Agreement, plus £90 per annum allowance whilst engaged on shift duties.

Closing date for receipt of applications, 7th April, 1961.

ASSISTANT ENGINEERS (Relief), NORTHAMPTON POWER STATION
(Vacancy No. 54/61).

Applications are invited for the positions of ASSISTANT ENGINEERS (Relief) at Northampton Power Station, Houghton Road, Northampton.

Applicants should have received a sound electrical training and have had experience in the operation of boiler and turbine plant. Preference will be given to candidates who possess the Higher National Certificate in Mechanical or Electrical Engineering, or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class G, Grade 12 (£765 - £870 per annum) of the National Joint Board Agreement, plus £90 per annum allowance whilst engaged on shift duties.

Closing date for receipt of applications, 7th April, 1961.

ASSISTANT CONTROL ENGINEER (Relief), NORTHAMPTON POWER STATION
(Vacancy No. 55/61).

Applications are invited for the position of ASSISTANT CONTROL ENGINEER (Relief) at Northampton Power Station, Houghton Road, Northampton.

Candidates for this post should be suitably qualified and have experience in the control room.

Salary will be in accordance with Class G, Grade 13 (£715 - £805 per annum) of the National Joint Board Agreement, plus £90 per annum allowance whilst engaged on shift duties.

Closing date for receipt of applications, 7th April, 1961.

ASSISTANT ENGINEERS (Relief), COVENTRY POWER STATION
(Vacancy No. 56/61).

Applications are invited for the positions of ASSISTANT ENGINEERS (Relief) at Coventry Power Station, Alderman's Green, Coventry.

Applicants should have received a sound electrical training and have had experience in the operation of boiler and turbine plant. Preference will be given to candidates who possess the Higher National Certificate in Mechanical or Electrical Engineering, or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class G, Grade 12 (£765 - £870 per annum) of the National Joint Board Agreement, plus £90 per annum allowance whilst engaged on shift duties.

Closing date for receipt of applications, 7th April, 1961.

ASSISTANT ENGINEERS (Relief), WARWICK POWER STATION
(Vacancy No. 57/61).

Applications are invited for the positions of ASSISTANT ENGINEERS (Relief) at Warwick Power Station, Emscote Rd., Warwick.

Applicants should have received a sound electrical training and have had experience in the operation of boiler and turbine plant. Preference will be given to candidates who possess the Higher National Certificate in Mechanical or Electrical Engineering, or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class E, Grade 12 (£670 - £750 per annum) of the National Joint Board Agreement, plus £90 per annum allowance whilst engaged on shift duties.

Closing date for receipt of applications, 7th April, 1961.

SECOND ASSISTANT STATION CHEMIST, STAYTHORPE "A" AND "B" POWER STATIONS
(Vacancy No. 58/61).

Applications are invited for the position of SECOND ASSISTANT STATION CHEMIST at Staythorpe "A" and "B" Power Stations, near Newark, Notts.

Candidates should have had previous experience in a power station laboratory and should hold the Higher National Certificate in Chemistry. They should be familiar with the methods of sampling and analysis of coal, water and oil and with the interpretation and application of the analytical results.

Salary will be in accordance with Class M, Grade 11 (£1,190-£1,325 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 7th April, 1961.

ASSISTANT PLANNING ENGINEER, STAYTHORPE "A" AND "B" POWER STATIONS
(Vacancy No. 59/61).

Applications are invited for the position of ASSISTANT PLANNING ENGINEER at Staythorpe "A" and "B" Power Stations, near Newark, Notts.

Applicants should have held a position of responsibility in a modern power station and should have received a thorough practical and theoretical training.

Preference will be given to candidates who are corporate members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 8 (£1,440 - £1,610 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 7th April, 1961.

ASSISTANT EFFICIENCY ENGINEER, STAYTHORPE "A" AND "B" POWER STATIONS
(Vacancy No. 60/61).

Applications are invited for the position of ASSISTANT EFFICIENCY ENGINEER at Staythorpe "A" and "B" Power Stations, near Newark, Notts.

Applicants should have held a position of responsibility in a modern power station and should have received a thorough practical and theoretical training.

Preference will be given to candidates who are corporate members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 8 (£1,440 - £1,610 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 7th April, 1961.

ASSISTANT ENGINEERS (Relief), HIGH MARNHAM POWER STATION
(Vacancy No. 61/61).

Applications are invited for the positions of ASSISTANT ENGINEERS (Relief) at High Marnham Power Station, near Newark, Notts.

Applicants should have received a sound electrical training and have had experience in the operation and control of modern high-pressure boiler and turbine plant. Preference will be given to candidates who possess the Higher National Certificate in Mechanical or Electrical Engineering or its equivalent.

Salary will be in accordance with Class N, Grade 12 (£1,190 - £1,325 per annum) of the

(Continued on next page)

C.E.G.B. (East Midlands Division) *continued*

National Joint Board Agreement, plus 10% allowance whilst engaged on shift duties.

Closing date for receipt of applications, 7th April, 1961.

STATION SHIFT CONTROL ENGINEER,
WILLINGTON "A" POWER STATION
(Vacancy No. 62/61).

Applications are invited for the position of STATION SHIFT CONTROL ENGINEER at Willington "A" Power Station, P.O. Box 27, Derby.

Applicants should have had a good general education and technical training with practical experience in the control and operation of large modern switchgear. Preference will be given to candidates who possess technical qualifications to Higher National standard.

Salary will be in accordance with Class L, Grade 10 (£1,190 - £1,325 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 7th April, 1961.

ASSISTANT ENGINEER (Relief),
BURTON-ON-TRENT
POWER STATION
(Vacancy No. 63/61).

Applications are invited for the position of ASSISTANT ENGINEER (Relief) at Burton-on-Trent Power Station, Wetmore Road, Burton-on-Trent, Staffs.

Applicants should have received a sound electrical training and have had experience in the operation of boiler and turbine plant. Preference will be given to candidates who hold the Higher National Certificate in Mechanical or Electrical Engineering, or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class E, Grade 12 (£670 - £750 per annum) of the National Joint Board Agreement, plus £90 per annum allowance whilst engaged on shift duties.

Closing date for receipt of applications, 7th April, 1961.

ASSISTANT ENGINEERS
(Control Room),
LEICESTER POWER STATION
(Vacancy No. 64/61).

Applications are invited for the positions of ASSISTANT ENGINEERS (Control Room) at Leicester Power Station, Rawdykes Road, Leicester.

Candidates for this post should be suitably qualified and have had experience in the control room.

Salary will be in accordance with Class G, Grade 13 (£715 - £805 per annum) of the National Joint Board Agreement, plus £90 per annum allowance whilst engaged on shift duties.

Closing date for receipt of applications, 7th April, 1961.

ASSISTANT ENGINEERS (Relief),
CASTLE DONINGTON
POWER STATION
(Vacancy No. 65/61).

Applications are invited for the positions of ASSISTANT ENGINEERS (Relief) at Castle Donington Power Station, near Derby.

Applicants should have received a sound electrical training and have had experience in the operation and control of modern high-pressure boiler and turbine plant. Preference will be given to candidates who possess the Higher National Certificate in Mechanical or Electrical Engineering or its equivalent.

Salary will be in accordance with Class L, Grade 12 (£1,040-£1,165 per annum) of the National Joint Board Agreement, plus 10% allowance whilst engaged on shift duties.

Closing date for receipt of applications, 7th April, 1961.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent concerned, and should be returned to him by the date stated.

O. S. WOODS,
Divisional Controller.
17th March, 1961. 8167

CLASSIFIED ADVERTISEMENTS
ARE PREPAID

CENTRAL ELECTRICITY GENERATING BOARD

EASTERN, LONDON & SOUTH EASTERN REGION

RESEARCH & DEVELOPMENT DEPARTMENT

ASSISTANT ENGINEER — Electrical Branch

VACANCY E.L.S.E. 8/61

Applications are invited for the above appointment in the Electrical Branch with laboratory facilities at West Farm Place, Chalk Lane, Cockfosters, Herts., and the successful applicant will be required to reside within a reasonable distance of the place of work. Duties will include responsibility on a national basis within the Generating Board for research work on corrosion of buried and submerged structures. In addition he will be expected to undertake routine service testing within the Region, and give specialist advice on all matters relating to underground corrosion and cathodic protection.

Experience in corrosion investigations is desirable and a knowledge of design, installation and field testing of cathodic protection schemes would be an advantage. A recognised Electrical Engineering qualification leading to Corporate Membership of the Institution of Electrical Engineers is required, and previous research and development experience would be an asset.

The annual salary will be in accordance with the N.J.B. Agreement, Schedule 'B', Class 'CX', Grades 6/8 (Third Assistant Engineer) Scales 12-14, £1,155 to £1,780 (including London Allowance).

RESEARCH CHEMIST — Chemistry Branch

VACANCY E.L.S.E. 9/61

Applications are invited for the above appointment in the Chemistry Branch with laboratory facilities at Brighton, Sussex, and the successful applicant will be expected to reside within reasonable distance of the place of work. Duties will include assistance in a research programme on the corrosion of heat exchange equipment in sea water. Candidates should be Graduates or equivalent, and a knowledge of metallurgy or metallic corrosion would be an advantage.

The annual salary will be in accordance with the N.J.B. Agreement, Schedule 'B', Class 'CX', Grades 9/11 (Fourth Assistant Engineer) Scales 9-11, £855 to £1,410.

Applications, giving age, qualifications and experience should be forwarded to the Regional Secretary, Central Electricity Generating Board, Eastern, London and South Eastern Region, Ergon House, Horseferry Road, London, S.W.1, to arrive by 5th April, 1961.

8133

BRUSH

BRUSH ELECTRICAL ENGINEERING COMPANY LIMITED
LOUGHBOROUGH, LEICESTERSHIRE
(*A member of the Hawker Siddeley Group*)

SALES DIVISION

TENDERING AND CONTRACTS ENGINEERS

Applications are invited from suitably qualified men who wish to work in one of the following fields:—

ROTATING ELECTRICAL MACHINES

SWITCHGEAR

Attractive salaries (according to age and experience) will be paid, and in appropriate cases assistance with housing and removal expenses can be considered.

Applications, WHICH WILL BE TREATED IN THE STRICTEST CONFIDENCE, should give details of qualifications and experience and be addressed to:—

Mr. A. Garner
BRUSH ELECTRICAL ENGINEERING COMPANY LIMITED
Loughborough, Leicestershire
quoting reference: PL.9927

7982

INSPECTOR (ELECTRICAL)

required by ADEN GOVERNMENT, Electricity Department, on contract for two tours, each of 18 months. Salary according to age and experience in scale (including Pay Differential) rising to £1,579 a year. Supplementary Allowance £144-£120 a year. Gratuity 12½ per cent of total salary drawn. Outfit Allowance £60. Free passages. Liberal leave on full salary.

Candidates, under 45 years of age, should possess C. & G. Full Technological Certificate in Electrical Installation Work or equiv. and must have completed a full apprenticeship preferably with an E.C.A. registered contractor. They must have experience in the inspection and testing of all types of installation and in the administration of the I.E.E. Regulations.

Apply to CROWN AGENTS, 4 Millbank, London, S.W.1, for application form and further particulars, stating age, name, brief details of qualifications and experience and quoting reference M2A/51256/EF. 8156

UNIVERSITY OF ST. ANDREWS

APPLICATIONS are invited for a SENIOR LECTURESHIP in Electrical Engineering in the Department of Electrical Engineering, Queen's College, Dundee, to commence not later than 1st October, 1961. Candidates should possess at least a good Honours Degree in Electrical Engineering or Physics and suitable experience in teaching and/or research, preferably with a special interest in electronics.

Salary scale £1,925 × £75 to £2,425. F.S.S.U.; family allowance; grant towards furniture removal expenses.

Applications (6 copies), containing the names of three referees, to the undernoted, from whom further particulars may be obtained, not later than 22nd April, 1961.

PATRICK CUMMING,
Joint Clerk to the
University Court.
Queen's College,
Dundee.
March, 1961.

8111

***Situations Vacant** (continued)*

South Western ELECTRICITY

APPLICATIONS are invited for the following positions :—

DISTRICT ENGINEER,
EXETER.

Salary within Class G, Grade 2, Salary Scale 14 (£1,535-£1,720 per annum) of the N.J.B. Agreement.

The successful applicant will be responsible to the District Manager for the planning, development, construction, operation and maintenance of the large urban and rural distribution system, including protective gear, in the District; also for the preparation of schemes and estimates and the control of capital and revenue expenditure.

The District contains 71,500 consumers, 540 miles of underground cable and 1,300 miles of overhead lines.

Candidates should possess extensive knowledge and have had wide experience of the engineering side of the industry, and be capable of promoting a progressive engineering development policy. They should have had wide experience of large load centres and be capable of administering a large department comprising technical, clerical and manual employees. Corporate Membership of the Institution of Electrical Engineers and the possession of a current driving licence are most desirable.

Applications to be made on standard form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, 3, Bedford Street, Exeter. Closing date for receipt of completed applications is 1st April, 1961.

SECOND ASSISTANT DISTRICT ENGINEER (Construction),
BARNSTAPLE.

Salary within Class E, Grade 7, Salary Scale 7 (£965 to £1,090 per annum) of the N.J.B. Agreement.

The person appointed will be required to take charge of all types of construction work, including H.V. and L.V. overhead lines and underground cables. He will also have a special responsibility for training labour and the formation of new gangs which are needed to carry out a large rural development programme. The person appointed will also be required to undertake standby duty.

Applicants should have good construction experience and possess a Higher National Certificate in Electrical Engineering or qualification leading to it. Possession of a current driving licence is desirable.

Applications to be made on standard form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, 7, Cross Street, Barnstaple. Closing date for receipt of completed applications is 15th April, 1961.

8114

ELECTRICAL ENGINEER

required for expanding Mechanical Engineering Company who manufacture capital plant for the paper and corrugated board industries. Applicants should possess a Higher National Certificate, have served an apprenticeship preferably with an electrical manufacturer, and have some practical experience of control gear and rotating machines. The successful candidate, whom we expect to be aged between 24 and 30, will join a small department which is responsible for specialised electric drives and control equipment supplied with our products.

Written applications to Masson Scott & Co. Ltd., Riverside Road, Summerstown, London, S.W.17.

8146

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Chilterns Sub-Area

THIRD ASSISTANT ENGINEER,
CONTROL (Shift Duties),
SYSTEM CONTROL CENTRE,
CHALTON, NR. LUTON (54/61.R).

Candidates should have had a sound technical training and wide experience of switching operations and maintenance work on H.V. distribution systems. Candidates should be fully conversant with the Central Electricity Safety Rules (Distribution) and should have a knowledge of protective systems.

Salary N.J.B. Class L, Grade 10 (£1,190-£1,325), plus 10% shift allowance.

Apply by letter by 7th April, 1961, to the Manager, Chilterns Sub-Area, Eastern Electricity Board, Prebend Street, Bedford.

Essex Sub-Area

GENERAL ASSISTANT ENGINEER,
OPERATION AND MAINTENANCE SECTION,
SUB-AREA HEADQUARTERS,
NR. BRENTWOOD (55/61.R).

Candidates should have had a sound technical training and possess the Higher National Certificate or equivalent qualification.

Salary N.J.B. Class L, Grade 14 (£890-£1,015), plus London allowance.

Apply by letter by 7th April, 1961, to the Engineer, Essex Sub-Area, Eastern Electricity Board, "Millfield," Bentley, Nr. Brentwood, Essex.

Suffolk Sub-Area

MANAGER,
COLCHESTER DISTRICT (56/61.R).

In view of the approaching retirement of Mr. G. P. Dixon, applications are invited for the above appointment.

Candidates should possess sound commercial, engineering and administrative experience in posts with managerial responsibility in electricity undertakings with both urban and rural characteristics. Corporate Membership of the Institution of Electrical Engineers will be regarded as an additional qualification.

Salary N.J.M. Class C, Grade 5 (£2,170-£2,380).

Apply by letter by 7th April, 1961, to the Manager, Suffolk Sub-Area, Eastern Electricity Board, Finborough Hall, Stowmarket, Suffolk.

8160

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

Littlebrook Power Station

SHIFT CHARGE ENGINEER
Vacancy No. 48A/61

The successful applicant would be expected to take charge of 480 MW of plant and should have had experience in a modern power station. Possession of H.N.C. together with operational experience of p.f. and oil firing would be an advantage.

Salary, N.J.B. Class "L," Grade 6, £1,748 10s. to £1,952, including London and Shift Allowances.

Applications, giving age, details of experience, qualifications, etc., should be sent to the Station Superintendent, Littlebrook Power Station, near Dartford, Kent, to arrive by 6th April. Previous applicants need not re-apply.

W. H. DUNKLEY,
Divisional Controller.

8157

BRITISH Enka LIMITED

ELECTRICAL ENGINEER

A GOOD opportunity for right man is offered by producers of man-made fibres and films for packaging, with international associations and up-to-date fundamental and technological research facilities.

Experience of installation, maintenance and operational work and of E.H.T. and M.V. systems necessary as well as the ability to organise and handle labour efficiently. Experience of the above in continuous chemical process a decided advantage.

Min. quals. Grad. I.E.E.

Good salary and prospects. Pension scheme with facilities for transfer, assistance with housing, and the usual amenities of a first-class organisation.

Applications stating age, qualifications and experience, in strict confidence, to Senior Staff Appointments Officer, British Enka Ltd., Aintree, Liverpool, 9.

8115

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

SHIFT CHARGE ENGINEER,
PORTSMOUTH GENERATING STATION (SEC/3.138).

Applicants should have had previous experience in a large generating station. Manufacturing works experience would be an advantage. Preference will be given to those possessing technical qualifications admitting to corporate membership of a recognised professional engineering institution.

Salary N.J.B. Grade H.7, £1,190-£1,325 plus 10% shift allowance.

Special application forms obtainable only from Divisional Secretary, 111, High Street, Portsmouth, should be returned by Tuesday, 4th April, 1961.

8138

DRAUGHTSMAN—ELECTRICAL

required by Consultants. Location Westminster. Ability to lead small team with some supervision. Experience of industrial installations essential. Academically O.N.C./H.N.C. advantageous. Necessarily salary will be decided on individual's experience, etc.

Details, please, of experience and employments to Sir Alexander Gibb & Partners, Queen Anne's Lodge, Westminster, London, S.W.1.

8117

ELECTRICAL CONTRACTORS' ASSOCIATION (INCORPORATED) AND ALLIED ASSOCIATIONS

THE above Associations invite applications for the post of CHIEF EXECUTIVE OFFICER. Experience in the electrical industry is desirable, but initiative, leadership, organising and negotiating ability are essential.

Applicants should apply to the President, 14, Bedford Row, London, W.C.1, for a form of application.

8051

PILKINGTON BROTHERS LIMITED

require an

ELECTRICAL ENGINEER

to take charge of the High Voltage Laboratory comprising power frequency and impulse test sections with test voltages of up to 1,300 kV and 2,000 kV respectively. An intensive programme of research and development relating to toughened glass power line insulators is in progress.

Applications stating age, qualifications, experience and present salary should be addressed to the

Personnel Officer
(Graduate Recruitment)
PILKINGTON BROTHERS LIMITED
St. Helens, Lancashire

8125

SMITH METERS LTD.

APPLICATIONS are invited for the appointment of an

ELECTRICAL SALES OFFICE MANAGER

Applicants must be technically conversant with electricity meters, all types, and ancillary apparatus, including test equipment, etc., able to handle all technical enquiries and quotations, home and export markets, and should be good correspondent and customer contact. Good salary and prospects of promotion. Superannuation scheme, etc.

Write in confidence stating age, qualifications, details of experience, etc., to :—

Personnel Manager
SMITH METERS LTD.
Rowan Road, Streatham Vale
London, S.W.16

8113

CROMPTON PARKINSON LIMITED

invite applications for positions as CONTRACT ENGINEERS at Chelmsford and Provincial Branches. Must be capable of preparing, tendering for and handling composite schemes involving the engineering application of switchgear, transformers, rotating plant and other products. Additional knowledge of cable work an advantage. Constructive and interesting work, including site visits throughout the U.K. and sometimes abroad. Superannuation scheme.

Write stating age and details of previous experience to Manager, Contract Department, Chelmsford. 8059

Monsanto

DRAUGHTSMEN

required in the London drawing office to work on the Electrical and Instrumentation side of Chemical Plant design:

ELECTRICAL DRAUGHTSMAN

for work on lighting, earthing and power installations, L.V. and M.V. distribution schemes, process control and alarm systems.

INSTRUMENTATION DRAUGHTSMAN

for work on process measurement and control involving pneumatic and thermo-couple control systems, layout of panel and field instrumentation, and schematic instrument hoop-ups.

Applications are invited from men aged 22-30 years with practical experience in the above types of work, although men with suitable workshop and D.O. experience and desire to work in the above fields of engineering will also be favourably considered.

Good starting salaries and prospects; non-contributory pension scheme and other benefits.

Applications giving details of age, qualifications and experience should be sent to:

The Staff Officer (DL 193)
MONSANTO CHEMICALS LIMITED
Monsanto House, 10/18 Victoria Street
London, S.W.1

8148

ELECTRICAL DRAUGHTSMAN AND ESTIMATOR/DRAUGHTSMAN

required by

J. LYONS & COMPANY LIMITED

(ICE CREAM DIVISION)

A vacancy exists for a SENIOR ELECTRICAL DRAUGHTSMAN required to have experience on General Distribution, Lighting, Motor Controls, Process and Sequence Controls associated with Automation. Some knowledge of Electronics would be an advantage.

A vacancy exists for a SENIOR ELECTRICAL ESTIMATOR/DRAUGHTSMAN required to have experience of Estimating for Electrical Contracting Installations, based on General Distribution Lighting, Motor Controls, Process and Sequence Controls. This will involve a certain amount of preparation of drawings to be used as a basis of estimates. H.N.C. desirable.

An attractive salary will be paid to the right men and the appointment offers good prospects for further advancement. The Company offers good conditions of service and a Contributory Pension Scheme. Holiday arrangements honoured.

Applications will be treated in the strictest confidence and should be made in writing to :—

The Personnel Manager
Lyons Maid House, Hammersmith Grove, London, W.6

7898

NORRIS CONSULTANTS LIMITED

require for their Electrical Engineering Department near Reading

ELECTRICAL DESIGNER-DRAUGHTSMEN.

Applications are invited from draughtsmen with experience in building installations, distribution and control equipment. Send full details, quoting reference M.R.N., to Beacon House, Queen's Road, Clifton, Bristol, 8. 8142

HUDDERSFIELD COLLEGE OF TECHNOLOGY

Principal: Dr. W. E. Scott, M.B.E.

Department of Electrical Engineering

APPLICATIONS are invited for TWO SENIOR LECTURESHIPS in Electrical Engineering. Duties to commence as soon as possible. Applicants should possess a University Degree and/or be Corporate Members of the Institution of Electrical Engineers. Experience in teaching and industry is essential.

Each Senior Lecturer will be required to teach up to Part III, I.E.E. level in at least two of the following subjects: Advanced Electrical Engineering, Electrical Machines, Utilisation of Electrical Plant, Electricity Supply, Electronic Engineering, Electrical Measurements. They will be expected to initiate and supervise project work carried out in the fourth year of the Sandwich Course for the College Associateships.

Salary (Burnham Scale) £1,550 p.a. by £50 p.a. to £1,750 p.a. The commencing salary will depend upon previous experience.

Forms of application and further particulars obtainable from the Principal, to whom applications should be returned without delay.

H. GRAY,
Clerk to the Governors.

9th March, 1961. 8116

LINDLEY THOMPSON

MIDLAND SALES REPRESENTATIVE

A REPRESENTATIVE is required to promote sales in the Midlands to Area Boards and industrial users. Applicants should preferably have sales experience and some knowledge of power transformers.

Applications, which will be treated in strict confidence, stating experience and salary required, to :—

The Managing Director
LINDLEY THOMPSON TRANSFORMER & SERVICE CO. LTD.
St. Mary's Road, Langley, Slough, Bucks

8043

Situations Vacant *(continued)*

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

APPLICATIONS invited for the following superannuable N.J.B. Schedule A appointments in the South Wales Division.

PLANT CONTROL ENGINEER,
ROGERSTONE POWER STATION,
ROGERSTONE, MON.
(Vacancy No. 59/ER/61).

Salary Class G, Grade 10, Scale 6, £890-£1,015 per annum, plus 10% shift enhancement.

Applicants should possess H.N.C. or equivalent qualification and have experience of the operation of modern high pressure and temperature unit plant.

ASSISTANT MAINTENANCE ENGINEER (M),
CARDIFF POWER STATION
(Vacancy No. 60/ER/61).

Salary Class F, Grade 8, Scale 7, £965 to £1,090 per annum.

Applicants should have experience in the maintenance of heavy plant and possess H.N.C. or equivalent qualifications.

Re-Advertisement

ASSISTANT SHIFT CHARGE ENGINEER,
LLYNFI POWER STATION,
NR. BRIDGEND, GLAM.
(Vacancy No. 61/ER/61).

Salary Class G, Grade 9, Scale 7, £965 to £1,090 per annum, plus 10% shift enhancement.

Applicants should possess H.N.C. or equivalent qualifications and have had operating experience in a modern power station.

Previous applicants need not re-apply.

STATION SHIFT CONTROL ENGINEER,
LLANELLY POWER STATION,
CARMS. (Vacancy No. 62/ER/61).

Salary Class E, Grade 10, Scale 4, £765 to £870 per annum, plus 10% shift enhancement.

Appropriate engineering qualifications and regular apprenticeship desirable, with operating experience in a power station.

THIRD ASSISTANT STATION CHEMIST,
CARMARTHEN BAY POWER
STATION, BURRY PORT, CARMS.
(Vacancy No. 63/ER/61).

Salary Class K, Grade 12, Scale 7, £965 to £1,090 per annum.

Applicants should possess H.N.C. (Chemistry) and have experience of testing and analysing coal.

The successful candidate will be responsible to the Station Chemist for a small team of coal samplers and laboratory assistants and to undertake other work leading to a wider experience of modern power station practice.

Special application forms obtainable from Divisional Secretary, Central Electricity Generating Board, South Wales Division, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 7th April, 1961. 8166

DRAUGHTSMEN REQUIRED

WITH EXPERIENCE OF CIRCUIT DIAGRAMS FOR LIFT CONTROL SYSTEMS

•

APPLY REF.: C.R.W.
J. & F. HALL LTD.
DARTFORD
KENT

8011

BRUSH

BRUSH ELECTRICAL ENGINEERING COMPANY LIMITED
LOUGHBOROUGH, LEICESTERSHIRE
(A member of the Hawker Siddeley Group)

MECHANICAL AND ELECTRICAL DRAUGHTSMEN

Applications are invited from suitably qualified men who have had experience of the following type of work :—

L.T. AND H.T. SWITCHGEAR (including circuitry)
ROTATING ELECTRICAL MACHINES (200 to 5,000 k.w.)
TRANSFORMERS
MOTOR CONTROL GEAR
GENERAL ENGINEERING
DIESEL-ELECTRIC LOCOMOTIVES

Attractive salaries (according to age and experience will be paid, and in appropriate cases assistance with housing and removal expenses can be considered.

Applications, WHICH WILL BE TREATED IN THE STRICTEST CONFIDENCE, should give details of qualifications and experience and be addressed to :—

Mr. A. Garner
BRUSH ELECTRICAL ENGINEERING COMPANY LIMITED
Loughborough, Leicestershire
quoting reference : PL.9926

7983

'ENGLISH ELECTRIC'

STAFFORD

New self contained works for light engineering products under construction for the meter, relay and instrument division

Have you the necessary qualifications with ideas, initiative and enthusiasm to be a member of this expanding Division? If so, you are invited to apply for the following vacancies :—

DESIGN ENGINEERS:
With a flair for creative design of light electrical or mechanical, electronic or solid state devices. Desirable qualifications Degree or H.N.C.

DESIGN DRAUGHTSMEN AND DRAUGHTSMEN:
With drawing office experience in any of the above fields.

MANUFACTURING ENGINEERS:
With sound practical training and experienced in Work Study. Desirable qualifications H.N.C. or equivalent.

SALES AND CONTRACTS ENGINEERS:
To prepare tenders and engineer contracts. Offering opportunities for transfer to branch technical sales staff, both home and overseas. Vacancies at technical levels equivalent to both O.N.C. and H.N.C.

SALES PROMOTION:
Senior and Junior men familiar with general publicity work, technical writing and market research.

APPLICATION ENGINEERS:
With experience in the application of protective relays, metering devices and electrical instruments. Opportunities exist for transfer to overseas branches. Desirable qualifications Degree or H.N.C. in electrical engineering.

SYSTEMS ENGINEERS:
With experience in the engineering of local and remote control and metering systems, incorporating relay, meter, instrument and associated transmission equipment. Desirable qualifications Degree or H.N.C. in electrical engineering.

WORKS SUPERVISOR:
With ability to organise, lead and control an important department engaged in the assembly of high quality electromagnetic products. Desirable qualifications H.N.C. or equivalent, preferably with experience in Work Study.

Remember, Stafford is set in a wide green belt with the National Trust country of Cannock Chase within 5 miles of the town centre. Housing and removal assistance will be given, and all enquiries should be addressed to the Technical Staff Officer, English Electric House, Strand, London, W.C.2, quoting reference ER1218P. 8140

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Third Assistant Engineer (Planning)

APPLICATIONS invited for the above post at Aberdeen. Experience in design and planning of overhead and underground systems at voltages up to 11 kV on both city and rural networks is necessary. 33-kV planning experience would be an advantage.

Salary £1,040-£1,165 (N.J.B. H.9, Scale 8) with placing according to qualifications and experience. Superannuation scheme.

Application form obtainable from the Area Manager, Millburn Street, Aberdeen, should be returned by 7th April, 1961. 8139

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER, GUILDFORD. Salary £765-£870 p.a. under N.J.B. Agreement, Class F, Grade 11. Superannuable. Applicants should have minimum qualification of the O.N.C. in Electrical Engineering and should possess general engineering experience preferably in the electricity supply industry. Consideration will be given to a private car allowance and assistance in house purchasing in appropriate circumstances.

Applications, quoting ER on form from District Manager, SEEBOARD, Woodbridge Road, Guildford, Surrey, by 5th April, 1961.

GEORGE WRAY,
Secretary.
8164

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts :—

(a) FOURTH ASSISTANT ENGINEER
(CONSTRUCTION),
MONMOUTHSHIRE AND
MID-WALES AREA, CWMBRAN.

Preference will be given to engineers possessing the Higher National Certificate in Electrical Engineering.

Salary N.J.B. Class K, Grade 13, Scale 6 (£890/£1,015 per annum).

Applications stating age, present position, present salary, qualifications and experience should be addressed to the Manager, Monmouthshire and Mid-Wales Area, Llywelyn Road, Cwmbran, Mon., to arrive not later than 8th April, 1961.

Please quote reference 30/61/ER, endorsing envelope "Assistant Engineer (Construction)."

(b) ASSISTANT ENGINEER,
MERTHYR DISTRICT,
CARDIFF AND
EAST CENTRAL AREA.

The duties of this post will be of a general nature and preference will be given to engineers possessing the Higher National Certificate in Electrical Engineering.

Salary N.J.B. Class G, Grade 9, Scale 7 (£965/£1,090 per annum).

Please quote reference 31/61/ER, endorsing envelope "Assistant Engineer."

(c) GENERAL ASSISTANT ENGINEER
(SURVEYOR/DRAUGHTSMAN),
BRIDGEND DISTRICT,
CARDIFF AND EAST CENTRAL AREA.

Salary N.J.B. Class F, Grade 11, Scale 4 (£765/£870 per annum).

Please quote reference 32/61/ER, endorsing envelope "Surveyor/Draughtsman."

Applications in respect of (b) and (c) stating age, present position, present salary, qualifications and experience should be addressed to C. L. Townsend, Assoc.I.E.E., Manager, Cardiff and East Central Area, 445/447, Cowbridge Road East, Cardiff, to arrive not later than 8th April, 1961.

R. G. WILLIAMS,
Secretary.

8151

BRUSH

(A Member of the Hawker Siddeley Group — Industrial Division)

RESEARCH DIVISION
INDUSTRIAL ELECTRONICS

Sales Specialist Engineer

A Senior Engineer is required to act as Sales Specialist for a wide range of industrial electronic equipment which includes calculators, remote control devices, telemetry and a variety of instrumentation systems. Candidates should possess good academic qualifications and have had several years' experience in both technical and sales fields.

Engineering Staff

Vacancies also exist for Senior and Intermediate Grade Research Engineers with at least three years' experience of applied research in one or more of the following fields :—

Instrument Design
Pulse Circuitry
Digital Computers
Transistor Circuitry
System Design
Line Communication

Applicants for these posts should have at least a good Honours Degree in either Electrical Engineering or Physics. Where appropriate, appointments will be made as Section Leader or Group Leader.

The Company is situated on the outskirts of a small town, amid the pleasant Leicestershire countryside away from the smoky industrial environment. Schooling facilities are good for all grades of education, including advanced studies at technical colleges and universities in the district. In appropriate cases, assistance with housing and removal expenses can be considered.

Applications, WHICH WILL BE TREATED IN THE STRICTEST CONFIDENCE, should give details of experience and qualifications and be addressed to:—

Mr. A. Garner
Brush Electrical Engineering Company Limited
Loughborough, Leicestershire
quoting reference: PL.9929

8026

EASTERN ELECTRICITY BOARD

South West Essex District

EXPERIENCED CABLE JOINTERS. N.J.I.C. rates and conditions; 42-hour, 5-day week.

Rate per hour, 5s. 10½d. for high-voltage jointers and 5s. 8½d. per hour for low-voltage jointers.

Apply by letter to the Manager, South West Essex District, Eastern Electricity Board, Ashton Road, Harold Hill, Romford, Essex. 8136

POWER HOUSE ENGINEERS

required by **Air Ministry** for 2-year tour in Aden under contract; some family accommodation available for married men. Starting salary is according to age, qualifications and experience and ranges from £743 at age 22 to £909 at age 28 or over, rising to max. of £1,014. Tax free foreign service allowance in addition to salary varies according to marital status and whether or not official accommodation is occupied, viz.:—

Single :—
  Accommodated £200 p.a.
  Unaccommodated £455 p.a.
Married :—
  Accompanied and in official accommodation £755 p.a.
  Accompanied and in private accommodation £1,190 p.a. and excess rent.
  Unaccompanied and in private accommodation £815-£855 p.a.
  Unaccompanied and in official accommodation £560 p.a.

Kit allowance and free passage overseas, also free passages for family, when private or official accommodation arranged. Free medical and educational arrangements and good sports facilities, 5-day week with 18 days' paid annual leave. Paid sick leave within certain limits.

Candidates must have had indentured apprenticeship of not less than 3 years, served preferably with a manufacturer of diesel engines of 300-2,000 b.h.p. Also not less than 5 years' experience following apprenticeship, at least 2 years of which should have been in a power house containing diesel engine-driven alternators. Experience of parallel running of alternators and of planned maintenance of power house plant would be an advantage. Preference given to candidates holding O.N.C. (Mech.) or equivalent.

Applicants, who must be natural-born British subjects, should write stating age, qualifications and experience to Manager (PE.520), Ministry of Labour, Professional and Executive Register, Atlantic House, Farringdon St., London, E.C.4. Selection will be by interview in London and some expenses entailed will be reimbursed.

268

DESIGN ENGINEERS

Applications are invited for the following appointments :—

SENIOR AND JUNIOR TRANSFORMER DESIGNERS, preferably with experience in rectifier transformers up to 2 MVA.

Senior applicants should possess H.N.C. or equivalent qualification.

Staff pension scheme in operation.

Applications stating age, qualifications, salary range, and quoting reference ENG/MC, to :—

Personel Manager
LANCASHIRE DYNAMO NEVELIN LTD.
Hurst Green, Oxted, Surrey

8060

PIONEER ELECTRIC
CANADA

SENIOR TRANSFORMER DESIGN ENGINEER wanted. Minimum education HNC in Electrical Engineering. Minimum experience ten years in design of 5 kVA to 50 MVA transformers.

SWITCHGEAR DESIGN ENGINEER wanted. Minimum education HNC in Electrical Engineering. Minimum experience five years or more in design of metalclad and metal enclosed switchgear up to 15 kV with some knowledge of high voltage circuit breakers preferred.

Salaries $6,500 to $9,000 depending on qualifications. Full details (including photograph) re education and experience to :—

PIONEER ELECTRIC LIMITED
1 Rockwood Place, Winnipeg 19, Manitoba, Canada

8057

***Situations Vacant** (continued)*

AIR MINISTRY

require ASSISTANT MECHANICAL AND ELECTRICAL ENGINEERS for design construction and maintenance of installations on airfields, radar stations, missile bases, workshops and maintenance units for R.A.F. at home and overseas as well as certain Civil Airports.

SALARY according to age, quals. and exp. from £936 (at 25) to £1,430 max. with increase for London and slight decrease in country districts. In addition salary is increased by £75 p.a. (within the maximum of scale) after 2 years' approved service subject to being Corporate Members of Institution of Mechanical or Electrical Engineers. Appointments long term with good prospects of pension and advancement to numerous posts in higher grades, viz.:—

- Mechanical and Electrical Engineers, £1,456-£1,950, 125 posts.
- Senior Mechanical and Electrical Engineers, £2,080-£2,392, 34 posts.
- Superintending and above Mechanical and Electrical Engineers, £2,650 upwards, 9 posts.

Vacancies occurring in higher grades are filled by promotion of existing staff.

Good opportunities for acquiring exp. overseas where special allowances ranging at present up to £1,800 p.a. according to location and marital status are payable in addition to higher salary. 5-day week with 4 weeks 2 days paid leave p.a. initially.

Quals.: (a) University degree or equiv. diploma in electrical and/or mechanical engineering with at least 2 years' apprenticeship; or (b) Graduate or Corporate Member of I.E.E. with at least 3 years' apprenticeship; or (c) Graduate or Corporate Member of I.Mech.E., appreciable electrical engineering exp. with at least 3 years' apprenticeship. In addition all candidates should have been employed for min. of 2 years with well established engineering concern and gained wide exp. in both electrical and mechanical engineering practice.

Applicants must be natural born British subjects between ages 25 and 45. Forms from Ministry of Labour, Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting D 128/1A. Selection will be by interview in London and certain expenses will be reimbursed. 248

MIDLANDS ELECTRICITY BOARD

THIRD ASSISTANT DISTRICT ENGINEER required in the Stourbridge District of the South Staffs and North Worcs Sub-Area.

Applicants should have wide experience in all branches of distribution work including construction, operation and maintenance of high voltage and low voltage underground cables and substations. Technical qualifications desirable.

Salary £890/£1,015 per annum (N.J.B. Grade F.9). Superannuable.

Apply by letter within 14 days, quoting reference SS/T/516, stating age, qualifications, experience, present position and salary to Mr. H. A. P. Caddell, Sub-Area Manager, Midlands Electricity Board, P.O. Box No. 9, Toll End Road, Tipton, Staffs.

F. W. CATER,
Secretary.
8144

NORTH WESTERN ELECTRICITY BOARD

Second Assistant Engineer (System Planning), Sub-Area Engineering Department, Kendal

THE prime duty of the successful applicant will be to co-ordinate the planning and programming of rural development in the Sub-Area, and experience in such work on a large scale is essential. He will also be required to assist in system planning and design at voltages up to and including 33 kV, for which experience in load flow investigations, protective gear application, plant specification and distribution construction will be an advantage. The H.N.C. (or equivalent) in Electrical Engineering is a necessary qualification.

Salary scale £1,350/£1,500 p.a., Grade K.7. N.J.B. conditions.

Applications on forms to be obtained from the Manager, No. 6 Sub-Area, North Western Electricity Board, Castle Green, Kendal, and returned to him by 5th April, 1961. 8137

The world's leading inventors and manufacturers of special purpose precision machinery for the Tobacco Industry have an opening in their London Drawing Office for :—

SENIOR ELECTRICAL ENGINEER

Desirable applicant should be aged 30-40, with considerable drawing office experience in the design of castings and small electrical parts for machining, technical qualifications at least up to H.N.C. level, and with practical experience in the design and application of control circuits for motors and electro-mechanical detector units. Some knowledge of electronics would be an advantage.

This opportunity is permanent and progressive; it offers immediate pensionable staff position with 3 weeks' Annual Holiday and attractive commencing terms.

Applications stating age, qualifications and experience should be personally addressed, in confidence, to

G. B. Salmon
MOLINS MACHINE COMPANY, LTD.
Evelyn Street, London, S.E.8

8044

ELECTRICAL DESIGN ENGINEERS

required for British Consultant's office overseas. Must be A.M.I.E.E. or equivalent and have at least five years' experience in one of the following fields:

1. Heavy industrial electrical installations, Oil or Chemical Industries preferably.
2. Overhead/Underground distribution networks to 33 kV including protective gear. Power Station design experience an advantage.
3. Complete electrical installations for Hospitals, Office blocks, etc., including lighting design.

Preferred age group 30/40, but consideration to others dependent upon qualifications and experience. Attractive salaries, accommodation provided, local and U.K. leave, two-year tours, renewable. Please furnish fullest particulars to Box 8147.

WORKS MANAGER AND ELECTRICAL ENGINEER

AN appointment will shortly become available as WORKS MANAGER to a small company in Cheshire possessing established sales connections with manufacturers of electrical equipment, local authorities, contractors and T.V. trade.

Some previous management experience is essential, together with a good general knowledge of the electrical industry. In addition, the directors would welcome new manufacturing proposals. Applicants should be qualified to accept a directorship, assuming satisfactory progress.

Educational and career details should be forwarded in confidence to—Box 8012.

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following post in the Electrical (Design and Construction) Department :—

FOURTH ASSISTANT ENGINEER,
DIVISIONAL HEADQUARTERS,
COCKFOSTERS, HERTS.
(S.V. No. 1463).

Salary N.J.B. within the range of £855-£1,090 plus £50 London weighting, rising after qualifying service to £1,165 per annum plus London weighting.

Applicants should possess or be studying for qualifications equivalent to Graduate Membership of the Institutions of Electrical or Mechanical Engineers.

The successful applicant will be required to assist in the installation of high-voltage substations and underground cables.

Applications, quoting Reference S.V. No. 1463, stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 8th April, 1961. 8132

EASTERN REGIONAL HOSPITAL BOARD

Appointment of Deputy Regional Engineer
Amended Advertisement

APPLICATIONS are invited for the appointment of DEPUTY REGIONAL ENGINEER on the Headquarters Staff of the Board. Candidates must be Corporate Members of the Institution of Electrical Engineers who have had experience in the design, planning and installation of electrical (lighting and power) works in hospitals or other similar building projects. The sucessful candidate will deputise for the Regional Engineer over the whole range of his duties, and accordingly preference will be given to the candidates who, in addition to electrical experience, have some experience or qualification in other branches of engineering, particularly heating and ventilating or mechanical engineering services.

Salary scale £1,450 to £1,770 per annum.

Applications, giving age, training, qualifications, past and present appointments, experience and the names and addresses of three referees to the Secretary, Eastern Regional Hospital Board, Vernonholme, Riverside Drive, Dundee, not later than 10th April, 1961. 8153

YORKSHIRE ELECTRICITY BOARD

No. 7 (Grimsby) Sub-Area

SECOND ASSISTANT ENGINEER (General Development).

Applicants should have had wide experience in the commercial activities within the electricity supply industry.

Salary N.J.B. Class K, Grade 7 (Scale 12), £1,350/£30/£1,500 p.a.

Applications, together with the names of two referees, should be sent to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than 7th April, 1961. 8162

FACTORY ELECTRICAL ENGINEER

required by

Lever Brothers, Port Sunlight, Limited

THE FACTORY ELECTRICAL ENGINEER is responsible to the Chief Engineer for the Electrical and Instrument Services in the factory. and has a staff of 3 Engineers, 9 Supervisors and about 130 works employees. The work entails responsibility for the maintenance of all electrical plant, including motors, control gear, a fleet of electric trucks, instruments and associated equipment; also all normal installation work and liaison on major projects. An important aspect of the work is the operation and maintenance of the Electrical and Instrument Workshops to provide these services.

Applicants, who should be aged 35 to 45, must have wide practical experience of factory electrical installations, including maintenance work on substation equipment, and should have considerable managerial experience. They must have attained Corporate Membership of the Institution of Electrical Engineers and should preferably hold a University Degree in Electrical Engineering. Salary will be commensurate with qualifications and experience.

The company operates a contributory pension scheme.

Applications should be sent to :—

The Personnel Director
LEVER BROTHERS, PORT SUNLIGHT, LIMITED
Port Sunlight, Cheshire

8112

SOUTHERN REGION BRITISH RAILWAYS

require a

Technical Assistant (Inspection)

in the Office of Mechanical and Electrical Engineer (Traction), London Bridge. Applicants should be familiar with testing and inspecting of all material used in the manufacture of electric and diesel-electric stock and power supply equipment at manufacturers' works. Manufacturing experience essential and technical qualifications desirable.

Salary range £945 per annum rising to £1,020 per annum after two years.

Application forms may be obtained from the Chief Mechanical and Electrical Engineer (Staff Section), Southern Region, British Railways, 15, St. Thomas Street, London Bridge, London, S.E.1.

8100

NEW ZEALAND

Department of Scientific and Industrial Research

APPLICATIONS are invited for the undermentioned vacancy :—

SENIOR PRINCIPAL SCIENTIFIC OFFICER, DOMINION PHYSICAL LABORATORY
(Vacancy No. 651).

To take charge of the Electrical Division of the Dominion Physical Laboratory. The work of this division includes the maintenance of the National Electrical Standards and a considerable programme of research in radio physics and upper atmosphere studies, including a major project of auroral investigation. It also covers work on acoustics, electronic development, and assistance to industry, particularly in the light electrical engineering field. Proven ability in research leadership is essential.

Salary up to £2,300 a year according to qualifications and experience.

PASSAGES : Steamer fares of up to £165 each for the appointee and his wife, and pro rata for dependent children, will be paid.

INCIDENTAL EXPENSES : Up to £35 for a single person and £100 for a married man can be claimed to cover the cost of taking personal effects to New Zealand.

Application forms and further details are available from the High Commissioner for New Zealand, 415, Strand, London, W.C.2, with whom applications will close on 28th April, 1961.

Please quote reference B13/18/2 when enquiring. 8135

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT CONSUMERS' ENGINEER required in the Northwich District of the Board's No. 2 Sub-Area. Salary within range £765/£870 per annum (N.J.B. F/11).

Duties will include estimating for contracting work, and advising consumers on matters relating to electricity supply and the utilisation of electrical equipment. Previous experience of work of this nature and a technical qualification desirable.

Appointment subject to medical examination. Pension Scheme.

Application forms obtainable from the Manager, No. 2 Sub-Area, Sandiway House, Northwich, Cheshire.

Closing date: 5th April, 1961. 8152

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

GENERAL ASSISTANT ENGINEER (Vacancy Notice ER/AV/34/61) required at Portishead " B " Power Station.

Superannuation scheme. Salary N.J.B. Class K, Grade 15, Scale 4, £765-£870 per annum.

Preference will be given to candidates who hold or are at present studying for a Higher National Certificate or similar qualification.

Applications on form A.E.6/ACT obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 4th April, 1961. 8163

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Dundee Area

APPLICATIONS are invited for the undermentioned appointment:—

SECOND ASSISTANT ENGINEER (PLANNING)

Applicants should have had a sound technical education and have obtained a Higher National Certificate or Engineering Degree. Preference will be given to Corporate Members of the Institution of Electrical Engineers.

Applicants should be well experienced in city and rural transmission and distribution planning up to 33 kV.

Duties will include planning of H.V. and L.V. reinforcements, distribution to new high density housing and city redevelopment works, also design of indoor and outdoor substations up to 33 kV.

Salary will be in accordance with National Joint Board Agreement, Schedule A, Class J, Grade 7, £1,275-£1,410 (Scale 11).

Applications should be on the standard application form, obtainable from the Area Manager, Dundee Area, 7, Dudhope Crescent Road, Dundee, and should be returned by 17th April, 1961. 8154

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS are invited for the following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule B. Salary includes London allowance.

FOURTH ASSISTANT ENGINEER,
MEASUREMENTS SECTION,
ELECTRICAL DEPARTMENT,
CHURCHFIELDS ROAD,
BECKENHAM, KENT
(Vacancy No. 61/157).

The successful candidate will be required to calibrate and test either polyphase meters and all types of indicating and recording instruments, or various types of electronic measuring instruments. Candidates should have H.N.C. (E.) or its equivalent, but consideration will be given to those holding O.N.C. (E.) providing they have adequate experience of the work outlined above and are continuing their studies.

Salary Class BX, Grade 11 = £905-£1,215, or Grade 10 = £985-£1,295 per annum according to qualifications and experience.

Applications, quoting vacancy number, to (or on form from) Personnel Officer, Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 5th April, 1961. 8134

ELECTRICAL DESIGNER

A.C. Rotating Machines

MAWDSLEY'S LTD., of Dursley, specialists in special machines, seek a qualified (H.N.C./Degree) ELECTRICAL ENGINEER to work on the design of A.C. motors and alternators (including 400-cycle).

Works training in the above products and 5-10 years' machine design experience are desirable.

The company has a contributory pension scheme and life assurance scheme, and will pay a good salary to the right man.

Applications should give full details, will be treated as absolutely confidential, and should be addressed to the Managing Director, Mawdsley's Ltd., Dursley. 8089

ADMINISTRATIVE COUNTY OF LEICESTER

ASSISTANT ELECTRICAL ENGINEER, £960-£1,140. Candidates must be Associate Members of the Institution of Electrical Engineers or be in possession of the Higher National Certificate and be experienced in the design of electrical installations for all types of buildings. Removal expenses and lodging allowances may be paid to a married man.

Apply by 14th April, 1961, on the form available from the County Architect, 123, London Road, Leicester. 8145

***Situations Vacant** (continued)*

LONDON TRANSFORMER PRODUCTS LTD.

require the following technical personnel for employment at their main works in Bridgend, Glam. The offices are situated in pleasant country surroundings in the vale of Glamorgan and five miles from the sea.

(1) SENIOR TRANSFORMER DESIGNER

with considerable experience of various types up to 5 MVA. Realistic initial salary together with progressive increases. A company house on advantageous terms is available to suitable applicant, preferably in age group 30-40.

(2) JUNIOR TRANSFORMER DESIGNER

with some experience of power and distribution units and with technical qualifications up to H.N.C. level. Initial salary according to experience together with progressive increases.

Application re (1) and (2) *to Chief Designer.*

(3) TRANSFORMER DRAUGHTSMEN

with experience on Distribution and Power Transformers up to 5 MVA. Salary according to age and experience. Application re (3) to Chief Draughtsman. 8149

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER required at Whitchurch in the Board's No. 4 Sub-Area. Salary within range £890/£1,015 per annum (N.J.B. F.9, Scale 6).

Applicants should preferably have had experience in the construction, operation and maintenance of overhead and underground high and medium voltage networks, with their associated substations and equipment.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, Nr. Wrexham.

Closing date, 7th April, 1961. 8165

A VACANCY occurs for a technical assistant to engineer, by discharge lamp ballast manufacturers situated in S.W. London. Duties include liaison with production shop, maintenance of technical file, and assistance in development laboratory. Inter. B.Sc. or O.N.C. preferred. Apply in first instance by letter stating experience, qualifications, to—Box 8171.

ADMINISTRATIVE assistant required for contracts manager of large London electrical company. To control the preparation of accounts, trading reports, statistics, etc., and personnel. The position is superannuated after a probationary period and has good prospects for an individual capable of working under his own initiative. Previous similar experience in contracting an advantage. Reply to—Box 8003.

ARMATURE winders, skilled, required for repair work. Apply—Browning's Electric Co. Ltd., Boleyn Castle, Green Street, London, E.13 (GRAngewood 4003). 8172

ASSISTANT electrical engineer required by Westminster consulting engineers. Must have working knowledge of construction of heavy electrical plant, turbines, generators, transformers, etc., and knowledge of inspection work. State salary, age, experience and qualifications.—Box 8169.

ASSISTANT electrical engineer required for interesting work in the design, planning and installation of complete power and lighting schemes for coal handling, screening and preparation plants. Age preferably not above 30, with a minimum qualification of Ordinary National Certificate in Electrical Engineering. Apply giving full details to—W. J. Jenkins & Co. Ltd., P.O. Box No. 3, Retford, Notts. 8065

ASSISTANT storekeeper required for electrical contractors in London W.C. area. Wages commence approx. £12 10s. p.w. Own pension scheme. Good prospects. All applications will be acknowledged.—Box 7943.

DRAUGHTSMAN required. Experience of wiring diagrams for medium/low voltage switchboards and motor control circuits. Existing holiday arrangements honoured. Superannuation scheme in operation. Apply—Chief Draughtsman, Varilectric Limited, 10, Melon Road, Peckham, London, S.E.15. 8173

DESIGN engineer required for consulting engineers' office to undertake the design of electrical services for all classes of buildings, including hospitals, industrial and commercial buildings, at home and abroad. Spring and summer holidays. Pension scheme and luncheon vouchers. Apply in writing, stating age, experience, present salary and salary required, to—J. Roger Preston & Partners, 15, North Audley Street, London, W.1. 8119

DESIGNER of small transformers 20 VA to 15 kVA, coil winding, delay lines, instrument transformers (must be experienced in latest designs and high standards) required by Scottish manufacturer to extend range of present lines. Good salary and superannuation, prospects of future directorship. Reply in confidence giving full particulars of experience and qualifications to—Box 8121.

DRAUGHTSMAN for electrical layout drawings and diagrams. Opportunity for young man to progress to preparation of specifications and estimating. Salary, pension, 5-day week, 3 weeks' vacation. Details to—Box 8130.

D.S.I.R. Building Research Station, Garston, Watford, Herts., requires engineer to work on problems related to efficiency in use and cost of engineering service installations in hospitals and other types of large domestic and public buildings. Quals.: Engineering degree and Corporate Membership of Institution of Mech. and/or Elect. Engineers with min. of 5 years' exp. in responsible position. Suitable exp. includes (1) design or development of engineering services in ship-building industry, e.g., heating and ventilation, electrical installations and layout for wiring, ducting and pipe runs; or (2) research, development or design in connection with service installation in factories or commercial buildings, chemical and processing plants, refineries, etc. Salary in range £1,416-£1,900 according to age, preferably 30-40. Prospects of promotion. 5-day week, canteen, social and sports facilities. Forms from Ministry of Labour, Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting D.133/1A. 8129

D.S.I.R. requires assistant experimental officer/experimental officer at Radio Research Station, Ditton Park, Slough, Bucks., to prepare abstracts of scientific and technical articles on radio research and development. Quals.: G.C.E. "A" level in 2 science or maths. subjects. Over 22, pass degree, H.N.C. or equiv., preferably in physics or electrical engineering generally expected. Exp. in radio research development, or communication, ability to read technical papers in French, German or Russian an advantage. Salary A.E.O. £450 10s. (age 18) to £776 (age 26) to £957; E.O. £1,057-£1,296. Forms from Ministry of Labour, Technical and Scientific Register (K), 26, King St., London, S.W.1, quoting A.104/1A. 8127

ELECTRICAL contractors London require estimator/engineer experienced in design and quotations for buildings of a commercial and industrial nature. Starting salary approx. £1,100 p.a. plus bonus. Full details to—Box 8106.

ELECTRICAL contractors require manager for branch office in Midlands. Capable of estimating to final account. Apply in confidence giving full particulars of experience and salary to—Box 8105.

ELECTRICAL engineer (construction) required by consulting engineers for work in the N.W. Duties comprise co-ordinating, programming and site supervision required for construction of 132/275-kW substations for the C.E.G.B. Applicants should be Associate Members or Graduates of the I.E.E. Salary according to experience, pension scheme, car provided. Applications to be on forms obtainable from Resident Engineer, Construction Department, Kennedy & Donkin, Park House, 813a, Wilmslow Road, Didsbury, Manchester, 20. 8170

ELECTRICAL engineer, senior, required by consulting engineers in London, with knowledge of distribution, control equipment and drives as applied to iron and steel works plant; also engineers for supervising erection of steelworks electrical equipment at home and abroad. Apply to—Box 8126, stating age, education, experience and salary required.

ELECTRICAL senior estimating engineer. First-class situation open large electrical company, London. Write age, experience, salary.—Box 8118.

ESTIMATING and contracts engineer for London office of control gear makers. Early prospects of promotion. Good salary. Pension scheme. State fully age, experience and salary required to Sales Manager, Lee Guinness Ltd., 25, Victoria Street, London, S.W.1. 8177

ESTIMATING/supervising and/or design and also junior engineer required for progressive positions for high-class installation work in an expanding company. Write in confidence stating age, experience and salary required to—Alliance Electrical, 2, Henrietta St., London, W.C.2. Progressive salary with possibility of a non-contributory pension and free life assurance. 118

EXPERIENCED estimator required familiar with medium/low voltage switchgear, starter panels, etc. Existing holiday arrangements honoured. Superannuation scheme in operation. Apply—Varilectric Limited, 10, Melon Road, Peckham, London, S.E.15. 8174

FALKS have a vacancy for an assistant to the electrical sales manager in the London area. Applicant should be between 28 and 40, must be capable of developing domestic appliance sales. The post is pensionable and permanent. Reply to "A" Dept., 91, Farringdon Road, London, E.C.1, stating full details of education, previous experience and salary required. 8168

FULLY qualified electricians required for general maintenance and installation work on large integrated iron and steel works. Excellent conditions, pension scheme in operation. Apply to—The Employment Officer, Appleby-Frodingham Steel Co., Scunthorpe, Lincs. 7992

HEATING engineer to join internal sales staff of expanding company. Applicants should have good technical background and experience of space heating, particularly off-peak storage heating. Duties include tenders, quotations, general correspondence and occasional site surveys. The off-peak heating media is used for a wide range of applications and the various products are widely used both at home and overseas. Good pension and life assurance scheme. Salary £1,000 plus according to qualifications. Write giving details of age, experience and career to date to Sales Director, Bastian & Allen Ltd., Ferndale Terrace, Harrow, Middlesex. 8109

MAJOR cable contractor operating in the N.E. area has vacancy for the superannuated post of supervising engineer. Applicants should hold O.N.C. or H.N.C. in Electrical Engineering. Similar experience with a major cable company or area board would be an added advantage. Apply stating age, experience and salary required to—Box 7968.

MANAGER for electrical contracting department required. Must be familiar with medium to large industrial and commercial installations. Write giving full details of age, experience and salary required to — Simpson Brothers (of Hapton) Ltd., Hapton, Burnley, Lancs. 8031

REPRESENTATIVE required by the electrical division of a large group of companies who have recently entered the domestic appliance market. Area to be covered South Western and South Wales Electricity Boards. Anticipated starting date 1st June, 1961. Superannuation scheme. Car provided.—Box 8123.

PLUMBER cable jointers and mates required for employment in London. Must be accustomed to working on live L.V. mains. London rates plus E.T.U. conditions. Generous overtime. Please reply to—Box 8107.

ROUND OAK STEEL WORKS Limited require a junior electrical engineer as assistant to the chief electrical engineer. The appointment carries responsibility for technical development and improvement under the general guidance of the chief electrical engineer. Candidates, preferably with experience in the heavy electrical field, should possess H.N.C. minimum, or graduate standard qualifications. Write giving age, details of experience, qualifications and salary level expected to the Manager, Personnel Dept., Round Oak Steel Works Ltd., Brierley Hill, Staffs. 8108

SENIOR and junior electrical design engineers/draughtsmen required for consulting engineers' office. 5-day week, luncheon vouchers, Spring and Summer holidays. Applicants for senior positions must be experienced in design of electrical services for modern hospitals, universities, factories, etc. Please apply stating age, experience and salary required to—J. Stinton Jones & Partners, 21, Gloucester Place, London, W.1. 142

SENIOR sales engineers required for London and Lancs/Yorks areas. Good salary. Car provided. Pension scheme. Recent experience of motor control gear and H.N.C. or equivalent required. State fully age, experience and salary required to Sales Manager, Lee Guinness Ltd., 25, Victoria Street, London, S.W.1. 8178

SUPERVISING engineer, experienced, required by expanding firm of electrical contractors N.W. London. Progressive position. Pension scheme. Write stating age and experience to—Box 196.

TECHNICAL assistant required in the Electrical and Mechanical Engineering Section of Chief Engineer's Department, with experience of modern electrical and mechanical installations in large buildings. Experience of heating and ventilating an advantage. Graduate or associate membership of recognised professional body preferred. Up to £960 according to qualifications and experience. Pension scheme. One Saturday only worked in five. Form from Chief Engineer (GS/R/724/3), L.C.C., County Hall, London, S.E.1. 8155

TECHNICAL sales engineer required by prominent switchgear and busbar trunking manufacturer, resident in Glasgow or Edinburgh, preferably with existing connections. Car provided. Non-contributory pension scheme in operation. Applicants should state age, experience and salary required.—Box 8047.

WAR Department requires electrical engineering officer at R.E.M.E. Telecommunications Branch, Christchurch, Hants, to prepare technical handbooks on line and cipher equipments; carry out trials of new cypher equip. for ease of maintenance and production of trial reports; advise design establishments on such matters and take defect and modification action for telecommunication equipt. Quals. and exp.: should possess A.M.I.E.E. or equiv. and have had wide knowledge and exp. of army line and cypher equip. and associated test equipts., also wide exp. of problems arising in repair of telecommunication equipt. by R.E.M.E. in the field. Salary £1,420-£1,900. Opportunities for establishment. Forms from Ministry of Labour, Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting D.143/1A. Closing date 10th April, 1961. 8128

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

ADVT. No. 195.—Advertiser wishes to thank all applicants and states that the situation has now been filled.

SITUATIONS WANTED

CONTRACTS manager (37), contracting industry 20 yrs., estimating/supervision installations, large industrial plants, hospital boards, etc., seeks change. Based North Herts. Own transport available.—Box 5047.

WORKING supervisor cable jointer and electrician, recently completed second overseas contract, 15 years' contracting experience, desires situation on overseas contracts, long or short tours. Particulars to—Box 5044.

ARTICLES FOR SALE

AVAILABLE FOR IMMEDIATE DELIVERY

ALTERNATORS, 50 Cycles.

1560 kVA	300 r.p.m.	650 kVA	375 r.p.m.
1500 „	500 „	640 „	750 „
1500 „	1000 „	625 „	1500 „
1200 „	750 „	500 „	600 „
800 „	750 „	500 „	750 „

and smaller.

SLIPRING MOTORS, 50 Cycles.

3600 h.p.	297 r.p.m.	Asynchronous.	1500 h.p.	750 r.p.m.	Autosynchronous.
3200 „	214 „	Selfstarting Synch.	1200 „	246 „	Asynchronous.
2400 „	245 „	Asynchronous.	800 „	230 „	„

and smaller.

(Most of the above Alternators and Motors can also be used for 60 cycles at respectively higher output and speed.)

COMMUTATOR MOTORS.
155/300 h.p. 300/640 r.p.m.

MOTOR GENERATORS AND WARD LEONARD SETS.
1000 kW 5000 v. A.C./500 v. D.C.
1000 kW 10000 v. A.C./240 v. D.C.
and smaller.

The machines will be delivered overhauled with guarantee.

INGENIÖRSFIRMAN MYRÉN & CO.
GOTHENBURG, SWEDEN
Cable : Elektromyrén

8150

HOUSE SERVICE METERS

200-240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

UNIVERSAL ELECTRICAL CO.
221, City Road, London, E.C.1 37

A.A. ELECTRICAL Co. for A.C.- D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd. London W4. 57

A BABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish, vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- slotmeters. Guaranteed 2 years, 2½-50 amps. From 55/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 2234/5/6). 169

A.C. and D.C. slotmeters and quarterlies. Reconditioned, guaranteed 2 years. Repairs and recalibrations.—Victor Electric Co., South View, Sweet Hill, Patcham, Brighton, Sussex. London agents, phone Downland 4682 (Surrey. 5001

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

ALTERNATORS for sale from 1,100 kVA at 750 r.p.m. down to ½ kVA. Single and three-phase. All voltages. More than 150 machines in stock. Automatic regulators and switchboards available.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS and generators, all types up to 150 kW.—Powerco Ltd., 312, York Road, London, S.W.18 (VAN. 5234). 151

BARGAINS in electric motors from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Ring Monarch 3355. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 170/-. See Quarterly.—Tradex, Surbiton. 170

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists. — Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CIRCUIT-breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards. — Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS, motor-alternators, motor-generators, frequency changers, etc. All types up to 100 kW.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

CROSSLEY 705-kVA diesel alternator set, type HSN8, eight-cylinder vertical engine direct coupled to E.E.C. alternator, 428 r.p.m. Manufactured 1951 and run less than 1,000 hours, 3,300/3/50 output, with step-down transformer to 400/3/50. Complete with switchboard. Inspection at our works. — Stewart Thomson Ltd., Seaforth, Liverpool, 21 (Tel. Bootle 2697/8). 8176

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

E.M.I. Industrial Mark 6 Camera, complete with control unit, tripod, channels 1 to 5, R.F. modulating unit, standard F.9 lens. "Som Berthiot" F2.4 to F22 "Zoom" lens (with view finder). Eleven months old. Perfect condition. Will work with standard T.V. receiver. Cost £700. Will sell £450 o.n.o.—Box 8120.

FLUORESCENT tubes reconditioned and guaranteed with a life as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks. Save 40% on your tube replacement costs by using this service. We are also manufacturers of top quality fluorescent fittings, trunking systems, control gear and new fluorescent tubes. Generous discounts available.—Anglo-American Electrical Company, Olive Street, Bury (Telephone, Bolton 27251). 212

FOR sale, good unused and used machinery including electric motors, A.C. and D.C. dynamos, alternators, transformers, diesel and steam electric generating sets, mains failure sets, motor generator and Ward Leonard sets, switchgear, compressors, fans, capacitors, etc.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford, Herts (Tel. B.S. 1000/1). 161

FOR sale, motor generator sets, input 400/440/3/50, output 420 and 520 amps. at 22 volts. Good condition. Low prices for prompt sale.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 8103

Articles for Sale (continued)

GENERATING sets, portable or stationary, new and reconditioned, 1 to 100 kW, A.C. and D.C. — Powerco Ltd., 312, York Road, London, S.W.18 (VAN. 5234). 148

INSULATING varnish, clear, Minerva No. 720, £10 per 40-gal. drum.—Lowton Metals Ltd., Sandy Lane, Lowton St. Mary's, Leigh, Lancs. (Tel. 71441/2). 93

KARDEX, Roneodex and Shannovue cabinets, as new.—F. H. Jolly & Co. Ltd., 289, King St., London, W.6 (RIV. 5381). 202

MOTOR generator sets and converters, all sizes and voltages from ½ kW up to 500 kW in stock. — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTORS and control gear, huge stocks all types, ½ to 200 h.p.—Ramsbottom & Co. Ltd., Elec. Engineers, Keighley (5444/7). 70

NAMEPLATES, engraving, diesinking, stencils. — Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

PHASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading. — Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. and D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PREPAYMENT 1s. slot house service meters. —Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switch-holder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. W. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY credit meters, single and polyphase, 2½-100 amps. From 20/-. Also D.C. See Television.—Tradex, Surbiton. 171

ROTARY converters in stock, all sizes; enquiries invited. — Universal Electrical, 221, City Road, London, E.C.1. 34

SIX transformers by Hewittic. 3,090 kVA, outdoor, tap changing, voltage range 33,000/33,000 in 2% steps. 2 each 3,200 kV outdoor, voltage 33,000/516 phase to neutral 3/12 phase. Inter-phase outdoor type. 750 MVA outdoor potential transformer, 33,000/110 volts ratio 500 amps. 218 kVA, 12-phase, 11,000 input 50 cycles, 3/6 phase, sec. volts 246, with automatic motor-operated tap changing.—Ballards Wharf, East Quay, Poole 334. 8175

SMALL BR screws and nuts in steel, brass and stainless steel, from stock. — Premier Screw & Repetition Co. Ltd., Woodgate, Leicester. 180

TELEVISION slotmeters and time switches. Details from: Tradex Meter Co., Surbiton (Elmbridge 2234/5/6). 172

VENNER time switches, 200-240 v. A.C./D.C., 10-30 amps., from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

WARD Leonard motor generating sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

400-cycle to 1,500-cycle motor alternators and alternators.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 27

500-kW, 220-volt Met.-Vick. rotary converter, with transformer, 11,000 volts, 3-phase, 50 cycles, and accessories.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 17

EQUIPMENT FOR HIRE

GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW, diesel or petrol, stationary or mobile, sale or hire, 24-hr. breakdown service. — Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401). 46

ARTICLES WANTED

A.C./D.C. electric motors, generators, transformers, disused stocks of cable, power houses bought and dismantled.—Samuel Hyams, 129, Lambs Lane, Rainham, Essex (Rainham 4896). 125

THREE 11,000-volt current transformers, ratio 25/5 amperes, or nearest.—Whitefield Machinery & Plant Limited, 48, Chatham St., Edgeley, Stockport, Cheshire. 8036

WANTED

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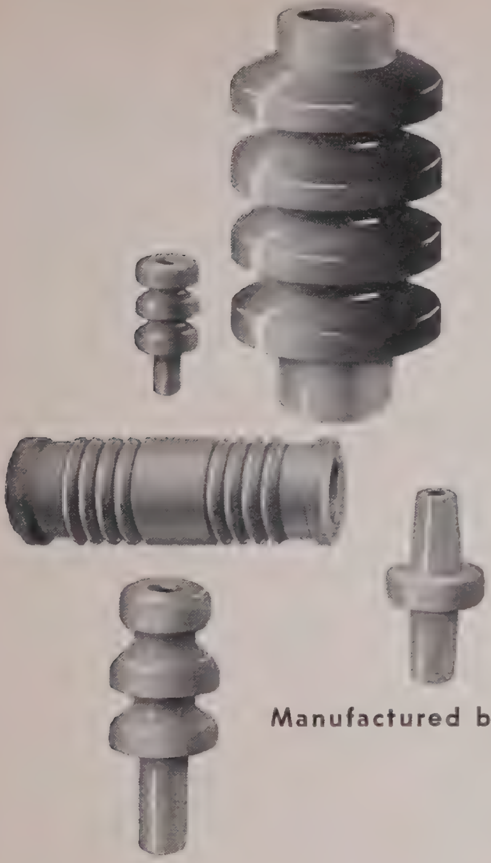

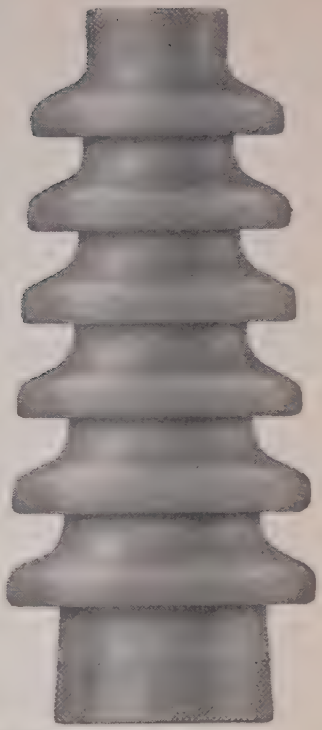

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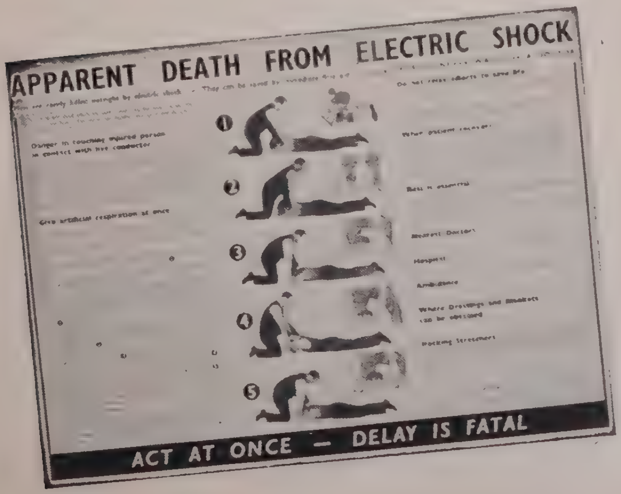

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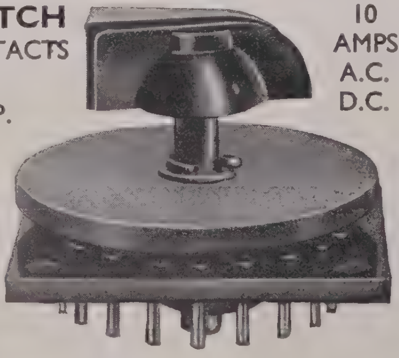

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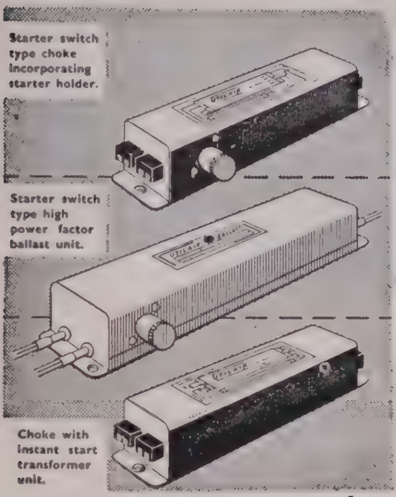

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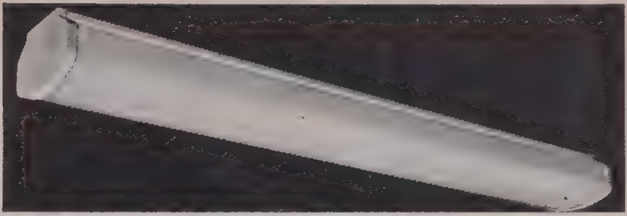

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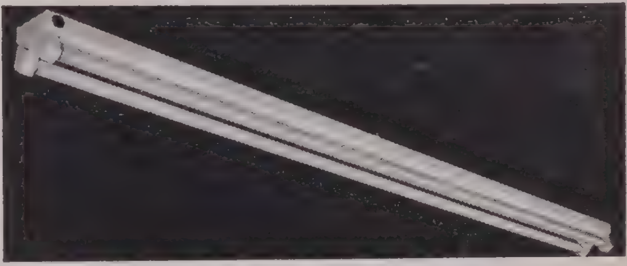

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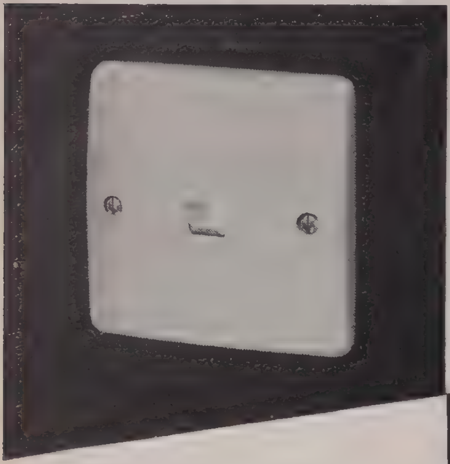

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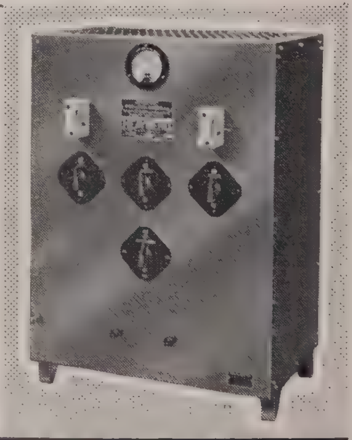

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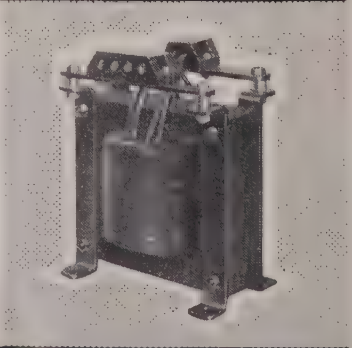

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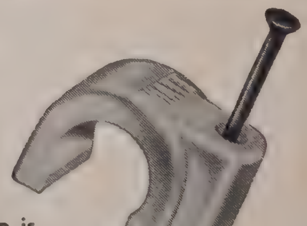

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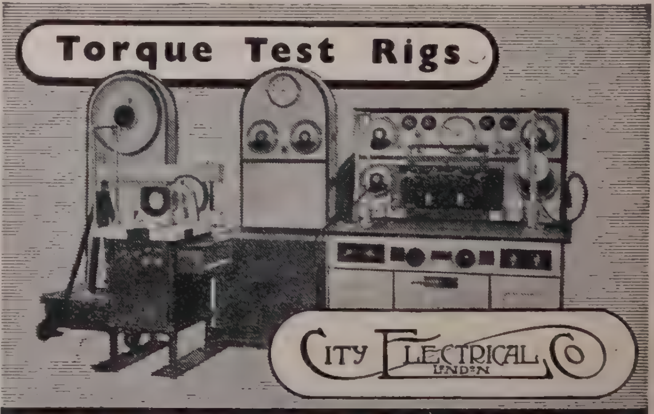

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ELECTRICAL REVIEW

VACUUM CLEANERS AND FLOOR POLISHERS

24
MARCH
1961

In recent years the rate of growth of the vacuum cleaner industry has been rapid indeed—in fact it is estimated that there are today approximately 11½ million vacuum cleaners in use in British households, representing nearly 75 per cent of the wired homes in this country.

According to a paper " The Future for Domestic Electrical Appliances " presented at the recent E.D.A. Sales Conference, the future potential cleaner market may well be limited by this high level of ownership, although there is evidence to support the view that the rate of replacement is increasing. At the present time, about one-third of sales are replacements and assuming that the average life of a cleaner is from 12 to 15 years, it can be demonstrated that replacement demand might now be expected to rise. Present indications are that the vacuum cleaner industry is faced with a relatively static market dominated by replacement sales, but one in which the overall demand will be maintained at a satisfactory level.

As will be seen from the following pages, several manufacturers are continuing with the models as listed in our previous survey on this subject. There are, however, one or two exceptions. Hoover, Ltd., for instance, have introduced a combined hand or upright cleaner, the " Hooverette," while Goblin (B.V.C.), Ltd., are marketing three new models, two of which incorporate a " Filtair " air cleaning attachment (for the third Goblin model this is an optional extra). Bylock Electric, Ltd., have departed from conventional design with the introduction of the " Tablevac," a combined occasional table and cleaner, in which the motor and dustbag are contained within a table mounted on castors.

The number of homes with a floor polisher is, compared with vacuum-cleaner-equipped homes, very small—about 2 per cent of all households. Sales have, however, shown a tendency to rise in recent years and, with the increasing demand for parquet and similar floors, about 30,000 a year.

VACUUM CLEANERS

Manufacturer	Name or Model	Type	Motor	Special Features	Accessories	Finish	Price (excl. tax)	Purchase Tax
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	" Duco Balmoral "	Cylinder	350 W	Fully suppressed radio and T.V. Swivel hose connections in both end covers	Full set including disposable paper dust bags	Cream with brown end covers	£11 10 9	£2 2 3
	" Duco Major "	Upright	275 W	Fully suppressed radio and T.V. Motor driven brush agitator, adjustable nozzle	Nozzle, oval brush, crevice tool, 2ft tube extension and flexible hose	Maroon body and bag	£12 17 6 plus £3 4 0 (accessories)	£2 6 6 plus £0 5 9 (accessories)
	" Duco Standard "	Hand	150 W	Fully suppressed radio and T.V. Lightweight all-rubber nozzle incorp. brush	—	Maroon body and bag	£6 2 1	£1 2 1

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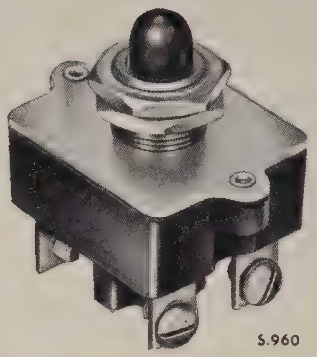
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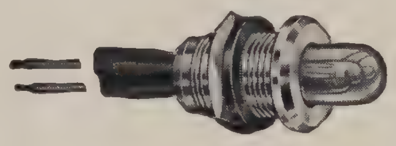
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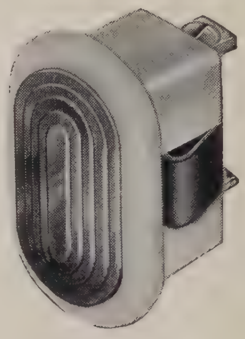
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Arcolectric Switches Ltd.

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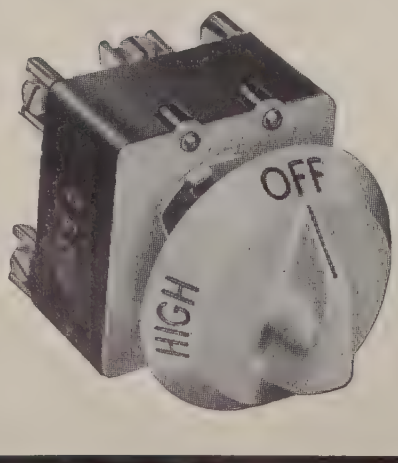

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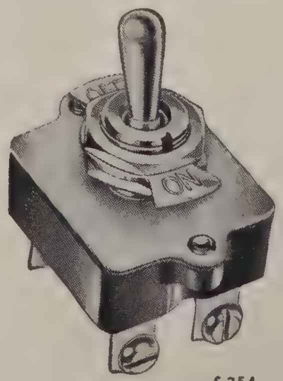

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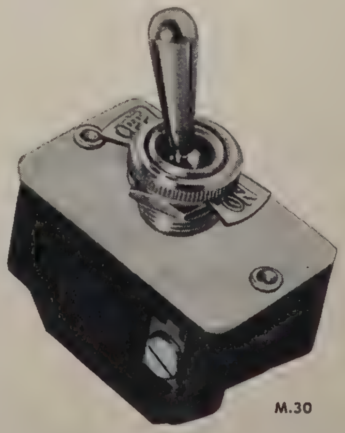

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VACUUM CLEANERS *[continued*

Manufacturer	Name or Model	Type	Motor	Special Features	Accessories	Finish	Price (excl. tax)	Purchase Tax
BROWN BROTHERS, LTD., **Great Eastern Street,** **London, E.C.2.** *(continued)*	"Duco De Luxe"	Hand	150 W	Fully suppressed radio and T.V. Detachable metal nozzle, 2ft tube extension	Ext. tube, furniture brush and crevice tool	Maroon body and bag	£6 15 9	£1 4 6
	"Duco Super"	Hand	160 W	T.V. suppressed, slide action switch	Ext. tube, oval brush, nozzle and crevice tool	Maroon and blue-grey	£6 15 0	£1 4 5
BYLOCK ELECTRIC, LTD., **South Street,** **Enfield,** **Middlesex.**	"Centurion De Luxe"	Cylinder	500 W	T.V. suppressed, balanced suction carpet nozzle, paper dust bags	Full set brushes and nozzles	Two-tone grey	£15 10 0	£2 16 9
	"Zephyr 350 De Luxe"	Cylinder	350 W	Switch in handle, paper dust bags, T.V. suppressed	Full set brushes and nozzles	Two-tone grey	£11 12 6	£2 2 6
	"Classic"	Cylinder	300 W	T.V. suppressed	Full set brushes and nozzles	Silver hammer and maroon	£9 9 6	£1 14 8
	"Minivac"	Cylinder, hand	180 W	T.V. suppressed	Nozzle, dusting brush, ext. wand	Off-white enamel body, chromium accessories	£7 5 0	£1 6 6
	"Tablevac"	Combination occasional table/cleaner	300 W	Dual-purpose table and cleaner, paper dust bags, castors	Full set brushes and nozzles	Polished walnut	£22 3 10	£4 1 2
R. CADISCH & SONS, **38-46, Orsman Road,** **London, N.1.**	"Cadison"	Cylinder	250 W	Swivel hose connection	Carpet nozzle, brush, crevice tool	Black diced leatherette, plated ends	£8 15 0	£1 12 9
	"Cadison" 1013	Hand	160 W	Fitted with hard rubber nozzle	—	Black crackle	£5 19 6	£1 2 6
	"Cadison" 1024	Hand	160 W	Lightweight, contemporary styled	Ext. tube, brush, metal nozzle, crevice tool	Two-tone grey, black bag	£6 15 0	£1 4 9
	"Cadison"	Upright	275 W	Rubber wheels, insulated handle grip	2 ext. tubes, crevice nozzle, carpet nozzle and brush	Biscuit and brown	£12 12 6 £3 0 0 (accessories)	£2 7 3 £0 5 6 (accessories)
CO-OPERATIVE WHOLESALE SOCIETY, LTD., **National Works,** **Hall Street,** **Dudley.**	"Invincible" 6020	Cylinder	250 W	—	1 nozzle, 1 crevice tool, 2 brushes	Leatherette and chromium	£9 1 9	£1 14 1
	"Invincible" 6014	Cylinder	300 W	—	2 nozzles, crevice tool, 2 brushes	Leatherette and chromium	£13 0 0	£2 8 9
	"Invincible" 6021	Cylinder	300 W	—	2 nozzles, crevice tool, 2 brushes	Leatherette and chromium	£10 3 0	£1 18 1
	"Invincible" 6023	Hand	180 W	—	Crevice tool, ext. tube, floor-brush (ext. hose 11s 7d extra)	Metallic grey and maroon	£6 13 4	£1 5 0
EDMUNDSONS ELECTRICAL WHOLESALERS, LTD., **240-250, Ferndale Road,** **London, S.W.9.**	"Summit" Standard SC.935	Cylinder	250 W	Toggle switch, T.V. suppressed	Grey plastic brushes and nozzles	Red patterned leathercloth, sprayed end caps	£8 7 8	£1 10 4
	"Aristocrat"	Cylinder "D" shape	250 W	T.V. and radio suppressed	Plastic brushes and nozzles	Grey and red	£9 15 3	£1 15 9
	"Summit Diamond" DC.959	Cylinder "D" shape	350 W	Double insulated, foot switch, T.V. and radio suppressed	Full set brushes and nozzles inc. carpet nozzle/floor brush	Two-tone grey and maroon	£11 14 0	£2 2 3
	"Summit" HN.960	Hand	160 W	T.V. and radio suppressed	Moulded rubber nozzle incorporating guard and brush	Grey and maroon	£6 10 0	£1 3 6
	"Summit" HA.939	Hand	160 W	Quick release bag, T.V. and radio suppressed	Ext. tube, brush and 2 nozzles	Grey and red	£6 19 6	£1 5 3
	"Summit" UC.961	Upright	230 W	Foot press switch, T.V. and radio suppressed	Full set brushes and nozzles (optional)	Two-tone grey	£15 0 0 £3 0 0 (accessories)	£2 14 2 £0 4 11 (accessories)

VACUUM CLEANERS *[continued*

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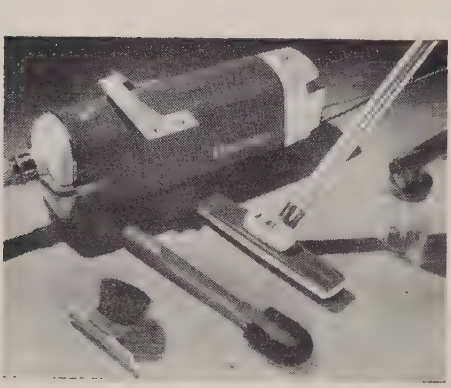
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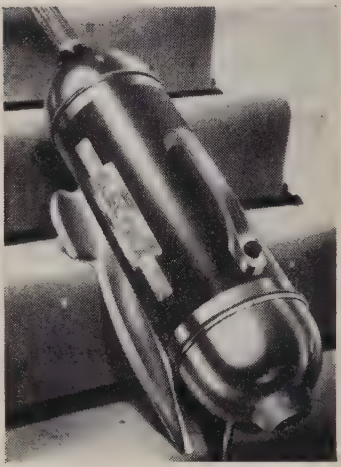
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1. *Bylock "Tablevac" combination occasional table and cleaner*
2. *Edmundsons' model UC.961 "Summit" upright cleaner*
3. *Brown Brothers "Duco Balmoral" cleaner with accessories*
4. *Electrolux model 65 cleaner with accessories*
5. *Electrix "Sterling" model 161 vacuum cleaner fitted with up-the-stairs skids*

Manufacturer	Name or Model	Type	Motor	Special Features	Accessories	Finish	Price (excl. tax)	Purchase Tax
ELECTRIX, LTD., Sterling Works, Dagenham, Essex.	"Sterling" 161	Cylinder	350 W	Foot switch, screw-in hose, swivelled carpet nozzle, suppressed, up-the-stairs skids	Full set of brushes and nozzles, and de-mother and spray-gun	Black and chromium	£18 12 10	£3 8 2
	"Sterling" 181	Cylinder	350 W	Foot switch, screw-in hose, swivelled carpet nozzle, suppressed	Full set brushes and nozzles	Two shades of grey	£14 12 11	£2 13 7
	"Sterling" 151	Cylinder	250 W	Screw-in hose, suppressed	9in floor nozzle, 8in floor brush, upholstery nozzle, crevice tool	Maroon and grey	£10 7 1	£1 17 11
ELECTROLUX, LTD., 153-5, Regent Street, London, W.1.	"Electrolux" 65	Cylinder	450 W	Combined floor and carpet tool. Combined dusting brush/upholstery nozzle. Telescopic extension tube. Wind-round flex storage. Sprayer	Crevice nozzle with detachable brush. Throw-away dust bags. Spare air-purifying pad	Rose colour plastic covering. Ivory end caps	£24 18 0	£4 13 5
	"Electrux" 64	Cylinder	375 W	Air purification pad. Foot switch	Full set of brushes and nozzles	Ivory colour plastic covering. Sepia end caps	£16 16 0	£3 3 0
EXPRESS VACUUM CLEANER CO., 96, Bath Street, Birmingham, 4.	"Express"	Cylinder	200 W	—	Full set brushes and nozzles	Black rexine and chromium	£16 0 0	£3 0 0
FALK, STADELMANN & CO., LTD., 91, Farringdon Road, London, E.C.4.	"Cleanette De-Luxe" U.95738	Hand	160 W	Swivelled carpet nozzle, curved ext. tube	Brushes, nozzles, crevice tool and tubes	Two-tone grey	£8 2 8	£1 9 9

VACUUM CLEANERS *[continued*

Manufacturer	Name or Model	Type	Motor	Special Features	Accessories	Finish	Price (excl. tax)	Purchase Tax
GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.	" DM.380A "	Upright	150 W	Double insulated. Suppressed for radio and T.V.	Full set brushes and nozzles	Grey and maroon	£18 2 8 £3 13 4 (accessories)	£3 6 4 £0 5 2 (accessories)
	" DM.540 "	Cylinder	500 W	Double insulated. Suppressed for radio and T.V., quiet running	Full set brushes and nozzles, and paper dust bags	Moonstone grey and red	£19 19 11	£3 13 1
GENWIND, New Trading Estate, Lode Lane, Solihull, Birmingham.	Genwind " One-Hand "	Hand	100 W	Lightweight	—	Black crackle and chromium	£7 0 0	£1 5 7
GOBLIN (B.V.C.), LTD., Goblin Works, Leatherhead, Surrey.	" Ace " G.71	Cylinder	500 W	Powerful motor combined with quietness	Full set brushes and nozzles	Green and maroon	£22 3 10	£4 1 2
	" Triumph " G.57	Cylinder	300 W	For the medium sized house	Full set brushes and nozzles	Ivory body and almond green	£15 10 8	£2 16 10
	" Popular " G.141	Cylinder	300 W	Low cost	Sufficient for all cleaning needs	Almond green body, chromium end covers	£13 6 4	£2 8 8
	" Minor " G.14	Cylinder	300 W	Low cost	Sufficient for house cleaning	Ivory body, almond green end covers	£10 7 2	£1 17 10
	" Wizard " De Luxe G.41	Upright	250 W	Beater brush	Full set brushes and nozzles	Ivory and blue enamel, blue dust bag	£16 8 5 plus £3 13 8 (accessories)	£3 0 1 plus £0 5 10 (accessories)
	" Imp " G.8	Hand Cleaner	175 W	Ideal for small spaces	Sufficient for house cleaning	Grey, burgundy dust bag	£8 4 10	£1 10 2
	G.72	Cylinder	500 W	" Filtair " attachment, deep-clean carpet tool	Full set brushes and nozzles	Red and ivory	£22 3 10	£4 1 2
	G.61	Cylinder	300 W	" Filtair " attachment, deep clean carpet tool	Full set brushes and nozzles	Mauve and ivory	£15 19 7	£2 18 5
	G.54	Cylinder	300 W	—	Sufficient for all cleaning needs	Yellow and ivory	£12 8 7	£2 5 5
HOOVER, LTD., Perivale, Greenford, Middlesex. *(Continued on next page)*	" 652 " De-Luxe	Upright	385 W	Exclusive agitator with beater bars and brushes. " Disposall " dust bag. " Dirt-finder " light. " Hooverflex " double-stretch hose. Instantly attached tools	Full set brushes and nozzles in flexible non-scratch plastic	Pearl white and heather rose	£30 6 3	£5 13 9
	" 1334 " Junior	Upright	250 W	Exclusive agitator with beater bars and brushes. " Hooverflex " double-stretch hose. Instantly attached tools	All-purpose brush set in flexible non-scratch plastic, crevice nozzle	Pearl white and deep rose	£21 4 6 £3 11 9 (accessories)	£3 19 7 £0 5 7 (accessories)

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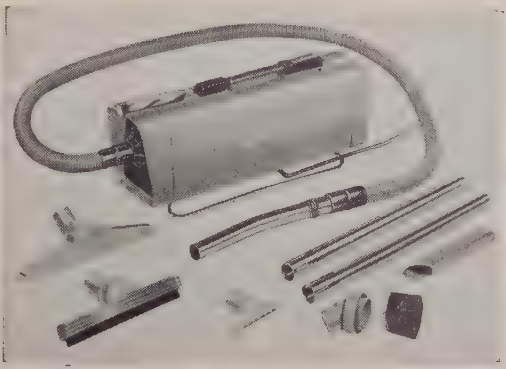
6. Falk, Stadelmann " Cleanette " hand cleaner

7. G.E.C. model DM.540 cleaner with accessories



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VACUUM CLEANERS *[continued*

Manufacturer	Name or Model	Type	Motor	Special Features	Accessories	Finish	Price (excl. tax)	Purchase Tax
HOOVER, LTD., **Perivale,** **Greenford,** **Middlesex.** *(Continued)*	"912" Heavy-duty	Upright	330 W	Exclusive agitator with beater bars and brushes. "Dirt-finder" light	—	Black and grey metal	£25 15 0	£4 16 7
	"417E"	Cylinder	465 W	"Hooverflex" double-stretch hose	Full set brushes and nozzles	Pearl white and wedgwood blue	£15 0 0	£2 16 3
	"Dustette" 2614	Hand	150 W	Shoulder strap. "Disposall" dust bag. "Hooverflex" double-stretch hose	Hose, ext. tube, 2 brushes set in flexible non-scratch plastic and crevice nozzle	Dark blue and pearl white	£9 13 8	£1 16 4
	"Dustette" 2504	Hand	150 W	—	All-purpose cleaning brush	Dark blue and pearl white	£7 11 2	£1 8 4
	"Constellation" 862	Spherical	600 W	"Disposall" dust bag. "Hooverflex" double-stretch hose, swivels through 360 deg	Hose, ext. tube, combined carpet and floor nozzle with brush and litter picker. All-purpose nozzle with litter picker. Dusting brush. Crevice tool	Pearl white and heather rose	£15 3 2	£2 16 10
	"Hooverette" 2944	Hand or Upright	240 W	Can be used as hand or floor cleaner. shoulder carrying strap provided. "Disposall" dust bag. "Hooverflex" hose	Combined carpet and floor nozzle, all-purpose brush, crevice nozzle, buffing pad	Blue and pearl white	£11 9 11	£2 3 1
KERRY'S (GREAT BRITAIN), LTD., **Warton Road,** **Stratford, E.15.**	"Kerry Blue"	Cylinder	350 W	Foot operated switch, stands upright for storage	Full set brushes and nozzles	Ivory and blue	£11 10 9	£2 2 3
	"Kerry"	Hand	160 W	—	Three nozzle accessories	Ivory and blue	£6 19 6	£1 5 6
LONOR, LTD., **1, Maddox Street,** **Regent Street,** **London, W.1** *(Continued on next page)*	"Siemens" VST.92	Hand	150 W	Perlon filter, radio suppressed, built-in switch	2 ext. tubes, carpet, hard surface, upholstery and crevice nozzles	Black and cream	£9 19 1	£1 11 11

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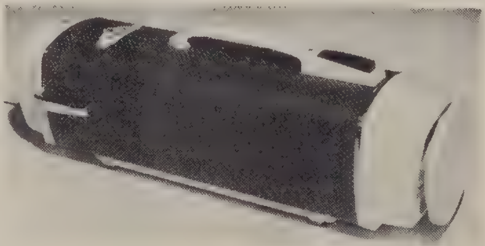

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8. *Hoover "Hooverette" in use as an upright cleaner*
9. *Goblin model G.72 cleaner fitted with the "Filtair" attachment*
10. *"Siemens" model VST.92 hand cleaner fitted with extension tube (Lonor, Ltd).*

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VACUUM CLEANERS *[continued*

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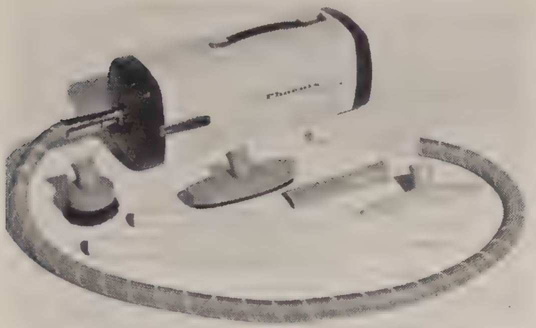
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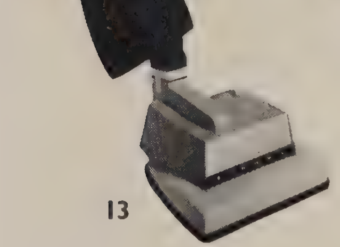
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1. *Radiation "Parnall Vibrabeat" model "Tenten" canister cleaner*
12. *Phœnix "Popular" Mk. II cleaner*
13. *Siroma model OB.2000 upright cleaner*
14. *Pifco "Vacette" hand cleaner*
15. *Morphy-Richards model VCA spherical cleaner*

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Manufacturer	Name or Model	Type	Motor	Special Features	Accessories	Finish	Price (excl. tax)	Purchase Tax
LONOR, LTD., **1, Maddox Street,** **Regent Street,** **London, W.1.** *(Continued)*	"Siemens" VST.101	Hand De-Luxe	220 W	Perlon filter, radio suppressed, D/P switch	2 ext. tubes, full set brushes and nozzles and polishing shoe, vaporiser and de-mother	Silver grey and red	£14 14 7	£2 7 3
	"Siemens" VST.203	Cylinder	360 W	Perlon filter, D/P pedal switch, radio suppressed	Full set brushes and nozzles (vaporiser, spray gun, polishing brush, etc., extra)	Silver grey and red	£17 4 0	£2 15 0
MORPHY-RICHARDS (CRAY), LTD., **50, Conduit Street,** **London, W.1.**	"Super Suction" VCA	Spherical	775 W to 950 W	1 h.p. motor, suction control device, swivelled hose entry, mounted on castors	Full set brushes and nozzles in washable plastic	Grey and white	£21 7 0	£3 17 0
NASH ELECTRICAL CO., LTD., **82, Snow Hill,** **Birmingham, 4.**	"Quikavac"	Upright	140 W	Lightweight	Full set brushes and nozzles	Various colours	£12 0 0	£2 5 0
PHŒNIX APPLIANCES, LTD., **Regina House,** **Marylebone Road,** **London, N.W.1.** *(Continued on next page)*	"Popular" Mk. II	Cylinder	315 W	—	Full set brushes and nozzles	Cream body, maroon end caps	£8 8 8	£1 10 10
	"Jet Power"	Cylinder	480 W	Extra power and suction	Full set brushes and nozzles	Blue body, chromium ends	£13 0 2	£2 7 7
	"Power Flo"	Cylinder (Box)	480 W	Extra power and suction	Full set brushes and nozzles	Grey body, maroon Bakelite ends	£13 0 2	£2 7 7
	"Cyclone"	Cylinder	315 W	—	Full set brushes and nozzles	Hammered body, red enamelled end caps	£9 15 3	£1 15 9
	"Mercury"	Cylinder	230 W	—	Full set brushes and nozzles	Hammered body, red enamelled end caps	£6 17 9	£1 6 3

BIG campaign for GOBLIN Filt-Air

Patent applied for

– biggest development since vacuum cleaners replaced the broom

FILT-AIR is quite new, quite capable of winning a valuable place in every British home because it promises the public a new standard of home hygiene with the best protection yet presented against the germ-carrying dust encountered in every cleaning operation.

It will be heralded by large space advertising —remarkable advertising, because no other manufacturer of vacuum cleaners has so powerful and dramatic a story to tell the public this Spring.

Major advance

Filt-Air did not just happen. It has sprung from the many years accumulated experience gained by the Goblin (B.V.C.) research department in the elimination of dust hazards in all kinds of situations —from hospitals to atomic power stations, from coal mines to aeroplanes. Like all major advances it involved months of research. Endless experiments were made. Independent Pathological Research Laboratories called in.

Complete success

The principle of Goblin's Filt-Air device has already won its laurels in the very place where the risk of infection from bacteria is at its most potent —in hospitals. It was a complete success. The public will say the same. Certainly many of them will be anxious to see and try the new Goblin Filt-Air. EXTRA SALES ATTRACTION Goblin's Filt-Air will be really Big News!

✳ 1961 *is Goblin's Diamond Jubilee Year and their programme is out to do it justice. A programme with bite—new modern styled cleaners with the* extra *attraction of Filt-Air and a new Deep Clean nozzle* (*a great success on rubber-backed carpets*)*—your sales will* soar !

YOUR QUESTIONS ANSWERED

What about my present stock of Goblin models?
Goblin Filt-Air attachments are available to bring all recent Goblin cylinder models in line with modern Goblin Filt-Air standards. Retail price 17/6 Tax Paid with two spare filter pads. Please specify model numbers to secure right fixings.

Will the Filt-Air require replacement?
The filter pads should be changed every week or so—more frequently if there is sickness in the home—that means real steady income for you. Retail price three for 2/6 (one size all models). Sell Goblin paper dust disposal bags too! the hygienic way to clean. Retail price 4/6 a doz.

What about Filt-Air for customers' existing Goblins?
Yes, more sales for you. You require the range of three couplings —clip, screw and friction. You can give all your recent Goblin customers Filt-Air service.

What can I do to make the best of this sales opportunity?
Contact your Goblin branch representative for full information.

GOBLIN (B.V.C.) LIMITED · GOBLIN WORKS · LEATHERHEAD · SURREY · Ashtead 866

VACUUM CLEANERS *[continued*

Manufacturer	Name or Model	Type	Motor	Special Features	Accessories	Finish	Price (excl. tax)	Purchase Tax
PHŒNIX APPLIANCES, LTD., **Regina House, Marylebone Road,** **London, N.W.1.** (*continued*)	" Flamingo "	Hand	295 W	—	Full set brushes and nozzles	Cream plastic casing, pink end caps	£7 2 0	£1 6 0
PIFCO, LTD., **Watling Street,** **Manchester, 4.**	" Vacette "	Hand	50 W	Lightness in weight) (2½ lb)	Two crevice nozzles	Grey and maroon	£5 1 5	£0 18 7
RADIATION, LTD. **(Electrical Division),** **255, North Circular Road,** **London, N.W.10.**	Parnall " Vibrabeat " model " Ten Ten "	Canister	500 W	Unusual design, portability, " Vibra-Beater " carpet cleaning attachment	Full set brushes and nozzles	Green, cream and gold	£24 0 0	£4 10 0
SIROMA ENGINEERING CO., LTD., **North Acton Road,** **Harlesden, N.W.10.**	HC.1035	Hand	160 W	Thumb action switch, fixed nozzle with brush and guard	—	Two-tone grey	£6 10 0	£1 3 9
	1022	Hand	160 W	Slide action switch, simple dust bag release, T.V. suppressed	Ext. tube, brush, nozzle, crevice tool	Stoved enamelled mist blue and brown	£6 17 6	£1 5 2
	400	Cylinder	250 W	Mounted on runners. R./T.V. suppressed. Neat nest handle	2 ext. tubes, oval brush, carpet nozzle, crevice tool	Maroon end covers, grey leathercloth cylinder	£8 17 6	£1 12 5
	500	Cylinder	250 W	Mounted on wheels and dome. R./T.V. suppressed. Neat nest handle	2 ext. tubes, oval brush, carpet nozzle, crevice tool	Nickel plated end covers, black leathercloth cylinder	£9 1 6	£1 13 2
	600	Cylinder	250 W	Mounted on tubular runners, toe-action switch. R./T.V. suppressed	2 ext. tubes, oval brush, carpet nozzle, upholstery nozzle, round brush, crevice tool	Stove enamelled beige and bracken	£9 16 6	£1 15 11
	700	Cylinder	350 W	Mounted on tubular runners, toe-action switch. Disposable dustbags, R./T.V. suppressed	2 ext. tubes, oval brush, round brush, upholstery nozzle, reversible swivel nozzle, large crevice tool	Green leathercloth cylinder. Stove enamelled green end covers	£12 9 6	£2 5 7
	800	Cylinder	350 W	Tubular runners, toe-action switch, disposable dustbags, R./T.V. suppressed	2 ext. tubes, oval brush, round brush, upholstery nozzle, reversible swivel nozzle, large crevice tool	Red leathercloth cylinder, end covers and fittings chromium plated	£13 8 0	2 9 0
	900	Cylinder	350 W	Square shaped cylinder runners, stands erect for easy storage, disposable dustbags. R./T.V. suppressed	2 ext. tubes, round brush, upholstery nozzle, large crevice tool, combined P.V.C. swivel and floor brush	Stove enamelled two-tone grey	£11 15 0	£2 3 0
	OB2000	Upright	230 W	Push-button switch, R./T.V. suppressed	Hose, brush and nozzles	Two-tone grey	£15 0 0 £3 0 0 (accessories)	£2 14 10 £0 4 10 (accessories)
ALBERT TAYLOR (MANCHESTER), LTD., **Quay Street,** **Manchester, 3.**	" Compet Major "	Upright	275 W	—	Full set brushes and nozzles	Grey anodised, black bag	£12 17 10 £3 0 0 (accessories)	£2 7 2 £0 8 9 (accessories)
	" Compet Senior "	Cylinder	350 W	Swivelled hose	Full set brushes and nozzles	Leatherette body, chromium ends	£12 1 5	£2 4 1
	" Compet Junior "	Cylinder	250 W	—	1 brush, 2 nozzles	Leatherette body, polished metal ends	£8 16 9	£1 12 3
	" Compet Handy "	Hand	160 W	Lightweight	1 brush, 2 nozzles	Two-tone grey, black bag	£6 15 0	£1 4 8
TELLUS SUPER VACUUM CLEANER, LTD., **39, Sheen Lane,** **Mortlake, S.W.14.**	" R.41 "	Canister	250 W	Hygienic metal dust container	Full set brushes and nozzles	Polished aluminium	£24 7 6	£4 9 1
	" G.70 "	Canister	450 W	Hygienic metal dust container	Full set brushes and nozzles	Polished aluminium	£30 15 6	£5 12 6

FLOOR POLISHERS

Manufacturer	Name or Model	Type	Motor	Weight	Special Features	Finish	Price (excl. tax)	Purchase Tax
BYLOCK ELECTRIC, LTD., **109, South Street,** **Ponders End,** **Middlesex.**	"532/3"	Three brush	325 W	24 lb	Incorporates scrubbers, scourers and polishers	Blue and chromium	£17 8 0	£3 3 8
	"Pacific"	Three brush	325 W	22½ lb	With suction bag	Grey and chromium	£19 8 6	£3 11 0
	"Contemporary" 325	Two brush	180 W	10 lb	Lightweight	Grey	£8 12 2	£1 11 6
COLUMBUS-DIXON, LTD., **Capitol Works,** **Empire Way,** **Wembley.**	"Columbus" III	Two brush suction polisher	500 W	27 lb	Attachments for vacuum cleaning, dusting, drying and scrubbing optional extras	Aluminium	£39 10 0	£7 8 2
EDMUNDSONS ELECTRICAL WHOLESALERS, LTD., **240-250, Ferndale Road,** **London, S.W.9.**	"Summit"	Two brush	200 W	17½ lb	Double insulated, T.V. and radio suppressed	Pink and mushroom	£14 4 0	£2 12 0
ELECTRIX, LTD., **Sterling Works,** **Dagenham, Essex.**	"Electrix"	Three brush	350 W	13¼ lb	Lightweight, foot-operated switch	Fawn and brown	£15 0 0	£2 14 10
ELECTROLUX, LTD., **153-5, Regent Street,** **London, W.1.**	"B.9"	Three brush	250 W	19 lb	Triangular body for getting into corners. Quiet action. T.V. suppressed	Maroon and grey hammer-tone enamel	£23 5 3	£4 7 3
	"Turbo Polisher" attachment	Single brush	—	1¾ lb (7¼ lb with shoe)	For use with "Electrolux 65" vacuum cleaner, detachable weighted shoe for flow polishing	Grey hammer-tone enamel	£7 11 1	£0 14 2

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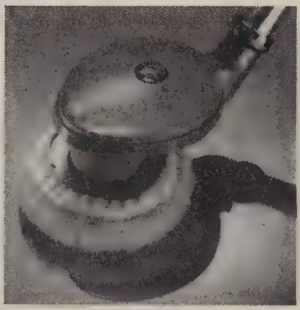

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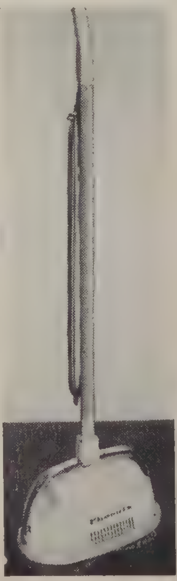
16. *Ladybird Appliances Mk. V floor polisher*
17. *Electrolux turbo-polisher attachment*
18. *Electrix three-brush floor polisher*
19. *Bylock model 532/3 three-brush polisher*
20. *Phœnix Appliances two-brush floor polisher*
21. *Truvox "Juno" polisher/scourer*
22. *"Siemens" BSM.100 floor polisher (Lonor, Ltd.)*



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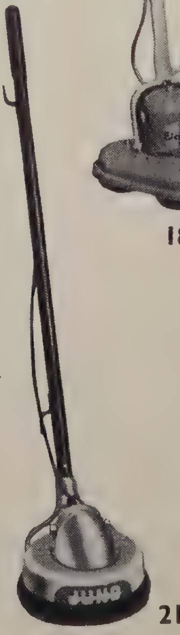

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Refrigerators (out of print)	6th May, 1960
Thermal Storage Water Heaters	3rd June, 1960
Electric Fires	8th July, 1960
Low Temperature Heaters	12th August, 1960
Blankets and Pads	16th September, 1960
Electric Cookers	28th October, 1960
Food Mixers, Kettles, Percolators and Toasters	2nd December, 1960
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GENERAL ELECTRIC CO., LTD., **Magnet House,** **Kingsway, W.C.2.**	" DM.342 "	Two brush	270 W	15 lb	Double insulated, T.V. suppressed, automatic switching	Two-tone grey	£20 18 1	£3 16 5
HOOVER, LTD., **Perivale,** **Greenford,** **Middlesex.**	" Hoover " 0212A	Two brush (contra-rotating)	225 W	13¾ lb	Scrubbing brushes and polishing pads. Headlight	Pearl white and wedgewood blue	£21 0 0	£3 18 9
LADYBIRD APPLIANCES, LTD., **Reliance Works,** **Oxford Road,** **Wokingham,** **Berks.**	" Ladybird " Mk. V	Two brush	300 W	12 lb	Double insulated " Styrene " scratchproof finish	Grey	£14 14 0	£2 12 0
LONOR, LTD., **1, Maddox Street,** **Regent Street,** **London, W.1.**	" Siemens " BSM.100	Two brush	180 W	8 lb	Toe switch, swivelled handle, rubber buffers	Cream	£20 11 9	£3 6 0
PHŒNIX APPLIANCES, LTD., **Regina House,** **Marylebone Road,** **London, N.W.1.**	" Phœnix "	Two brush	200 W	13 lb	Clip-on felt or lambswool pads available as extras	Salmon pink and mushroom	£14 4 1	£2 11 11
TELLUS SUPER VACUUM CLEANER, LTD., **39, Sheen Lane,** **Mortlake, S.W.14.**	" Tellus "	Three brush	300 W	24 lb	Quiet action, 2 sets brushes, felt pads	Polished aluminium	£29 11 9	£5 8 2
TRUVOX, LTD., **Neasden Lane,** **London, N.W.10.**	" Juno " polisher/scourer	Single brush	250 W	16½ lb	Revolving inner brush. Polishes, buffs, sands and scours	Chromium or stoved enamel	£22 1 0 (chromium) £21 0 0 (enamelled)	£3 19 7 (chromium) £3 15 10 (enamelled)

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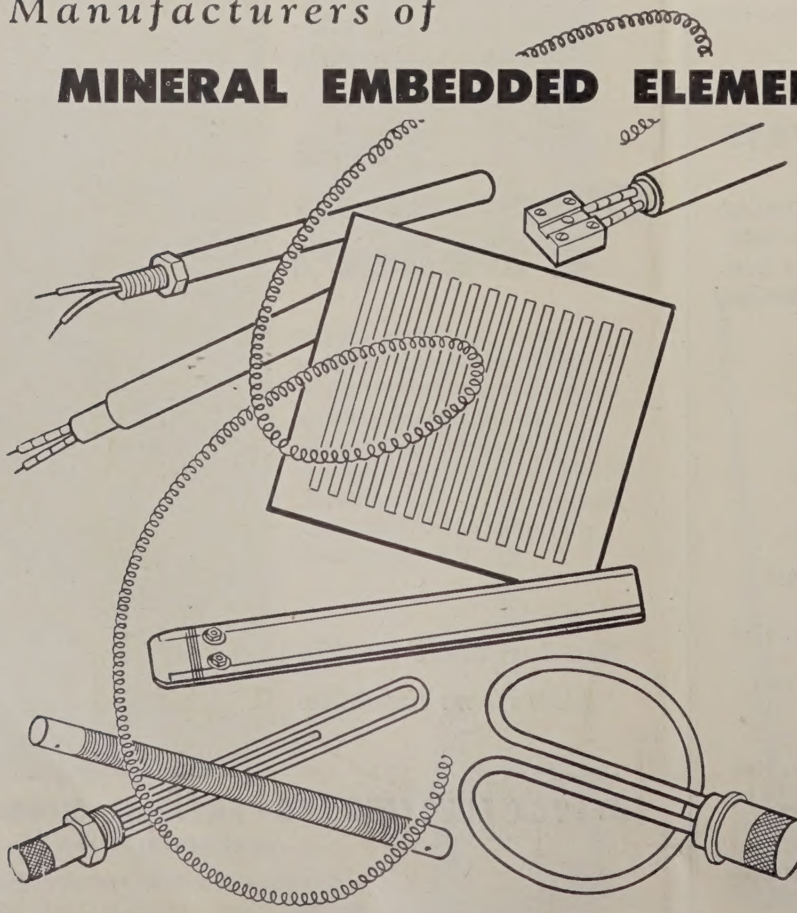

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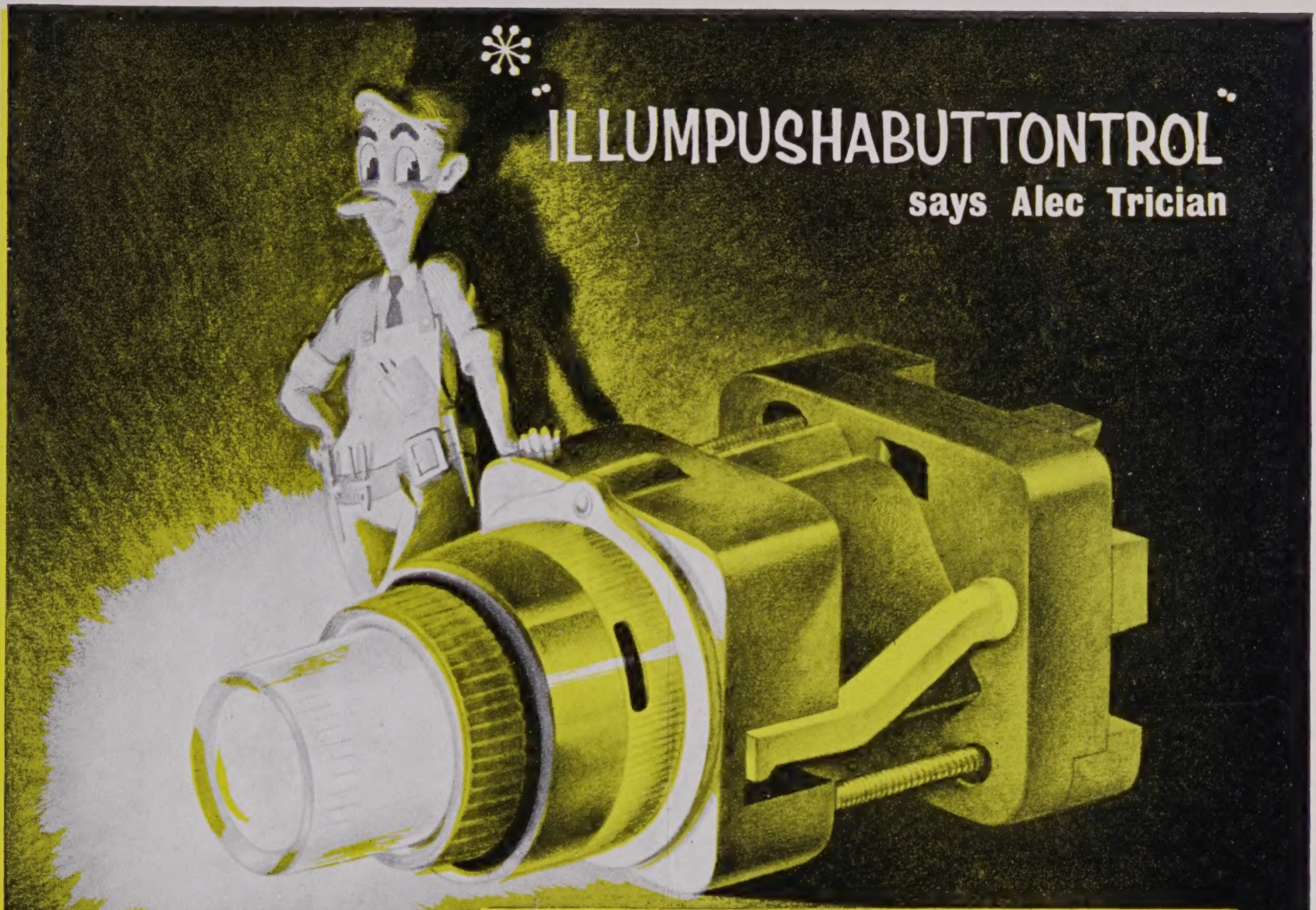

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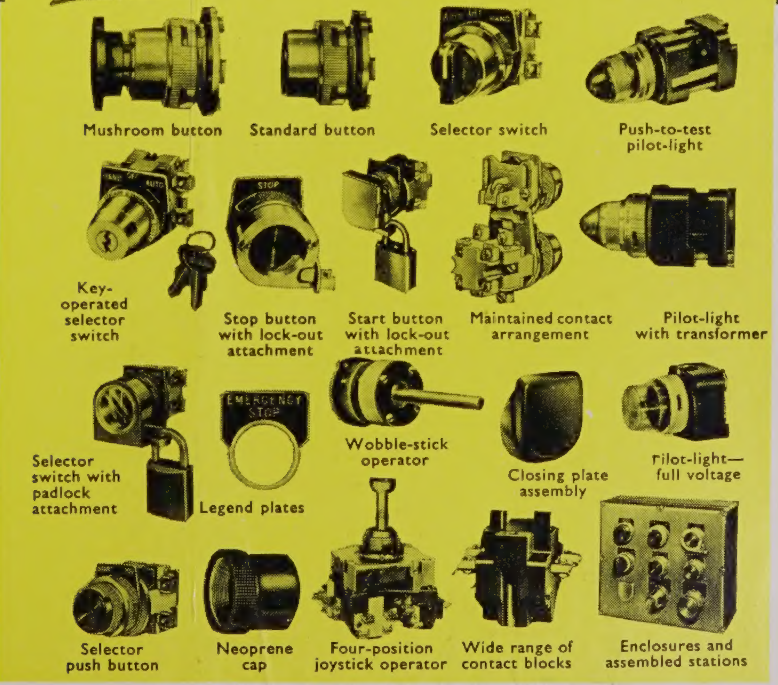
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Standard button
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Key-operated selector switch
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Start button with lock-out attachment
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Pilot-light with transformer
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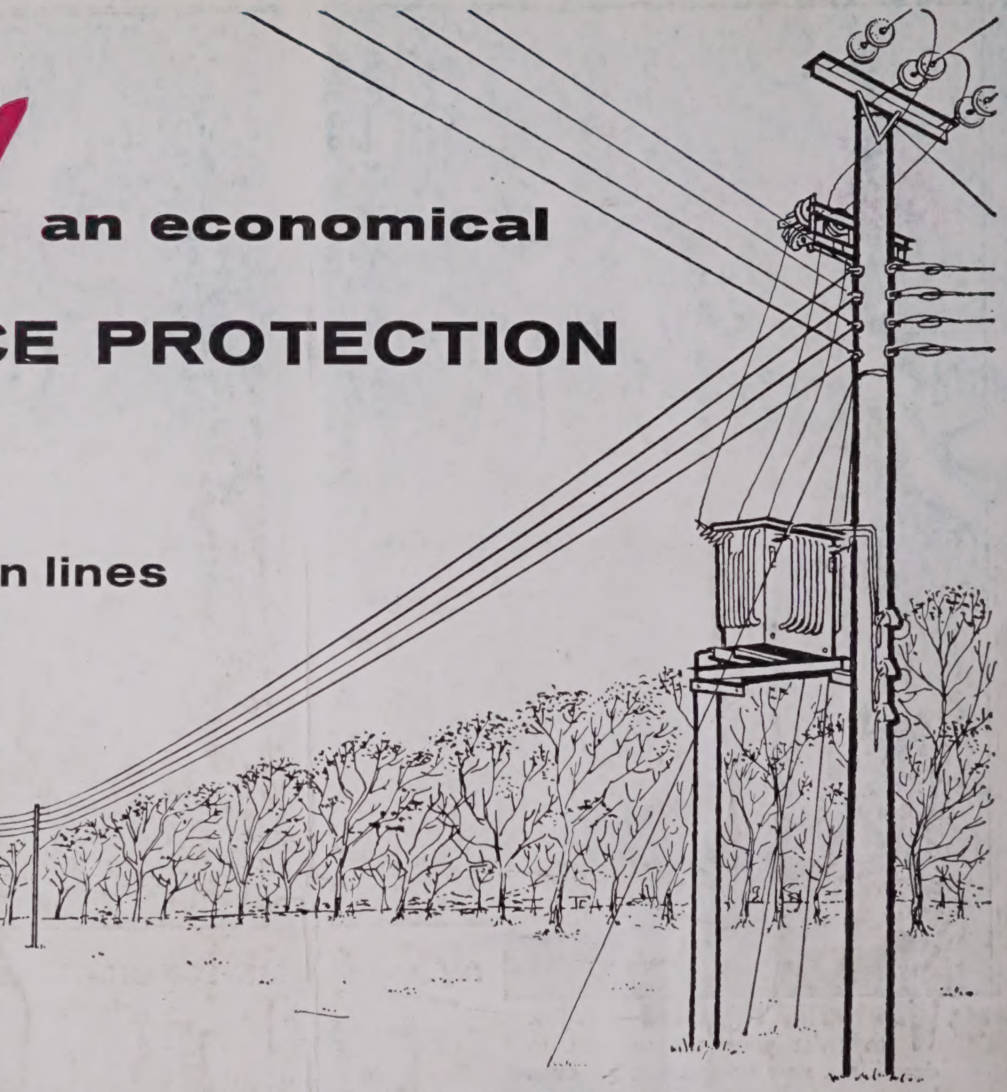

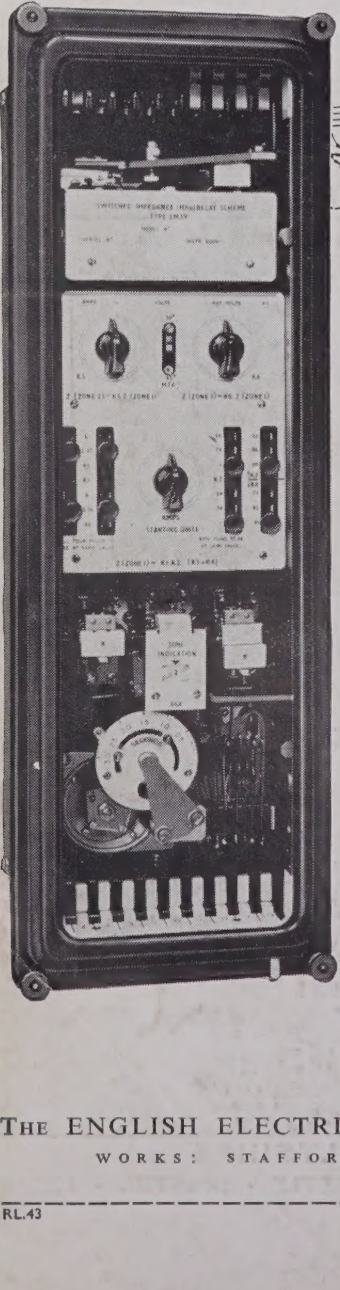

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